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Department of
Agriculture

Forest
Service

Washington, D.C.



Report of the Forest Service

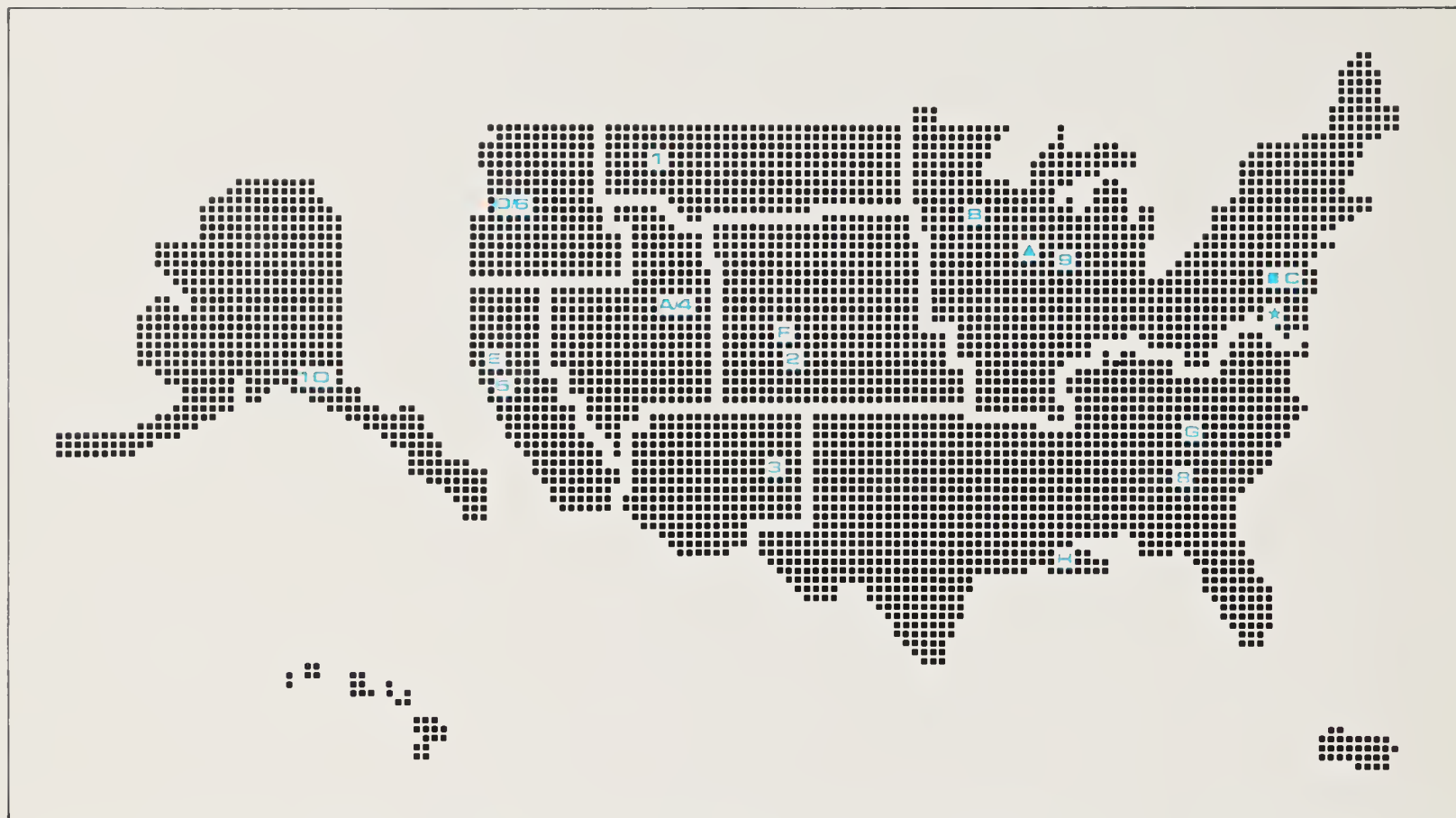
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Missoula, MT 59807
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P.O. Box 25127
Lakewood, CO 80225
- 3 Southwestern Region
Federal Bldg.
517 Gold Ave., SW
Albuquerque, NM 87102
- 4 Intermountain Region
Federal Bldg.
324 25th St.
Ogden, UT 84401
- 5 Pacific Southwest Region
600 Sansome St.
San Francisco, CA 94111
- 6 Pacific Northwest Region
11177 West 8th Ave.
Lakewood, CO 80225
- 7 Southwest Forest
11177 West 8th Ave.
Lakewood, CO 80225
- 8 Southeastern Forest
200 Weaver Blvd.
P.O. Box 2860
Asheville, NC 28802
- 9 Southern Forest
T-10210 U.S. Postal Service
Bldg.
701 Loyola Ave.
New Orleans, LA 70113
- 10 Forest Products Laboratory
Gifford Pinchot Dr.
P.O. Box 5130
Madison, WI 53705

9 Eastern Region
310 West Wisconsin Ave.
Milwaukee, WI 53203

10 Alaska Region
Federal Office Bldg.
P.O. Box 21628
Juneau, AK 99802

State and Private Forestry

State and Private Forestry
offices are located in the
Regional Headquarters, except
for the Eastern Region. This
S&PF office is at:

■ Northeastern Area – S&PF
370 Reed Rd.
Broomall, PA 19008

Forestry Research

- A Intermountain Forest and
Range Experiment Station
Federal Bldg.
324 25th St.
Ogden, UT 84401
- B North Central Forest
Experiment Station
1992 Folwell Ave.
St. Paul, MN 55108
- C Northeastern Forest
Experiment Station
370 Reed Rd.
Broomall, PA 19008
- D Pacific Northwest Forest
and Range Experiment Station
P.O. Box 3890
Portland, OR 97208
- E Pacific Southwest Forest
and Range Experiment Station
1960 Addison St.
Berkeley, CA 94704
- F Rocky Mountain Forest
and Range Experiment Station
240 West Prospect Ave.
Fort Collins, CO 80526
- G Southeastern Forest
Experiment Station
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United States
Department of
Agriculture

Forest
Service

Washington, D.C.



February 1988

Report of the Forest Service

Fiscal Year 1987

Report of the Forest Service Fiscal Year 1987

The Forest Service

The Forest Service, U.S. Department of Agriculture, is responsible for Federal leadership in forestry. It carries out this role through four main activities:

- Protection and management of resources on 191 million acres of National Forest System lands.
- Cooperation with State and local governments, forest industries, and private landowners to help protect and manage non-Federal forest and associated range and watershed lands.
- Research on all aspects of forestry, rangeland management, and forest resources utilization.
- Participation with other agencies in human resource and community assistance programs to improve living conditions in rural areas.





1988 Statistics

Receipts
\$1.46 billion

Expenditures
\$2.35 billion

Permanent
Full-time
Employees
27,400

Woodland
Owners
Assisted
158,353

Forest
Lands
Burned
850,000
Acres

Human
Resource
Programs
80,718
Persons
Served

Research
Publications
2,237

National
Forest System
191 Million
Acres

Wilderness
32.5 Million
Acres

Roads
344,000
Miles

Trails
102,500
Miles

Recreation
Use
238.5 Million
Visitor
Days

Timber
Sold
1.3 Billion
Board Feet

Grazing
Permits
Administered
12,489

Wildlife and
Fish Habitat
Improvements
124,133
Acres

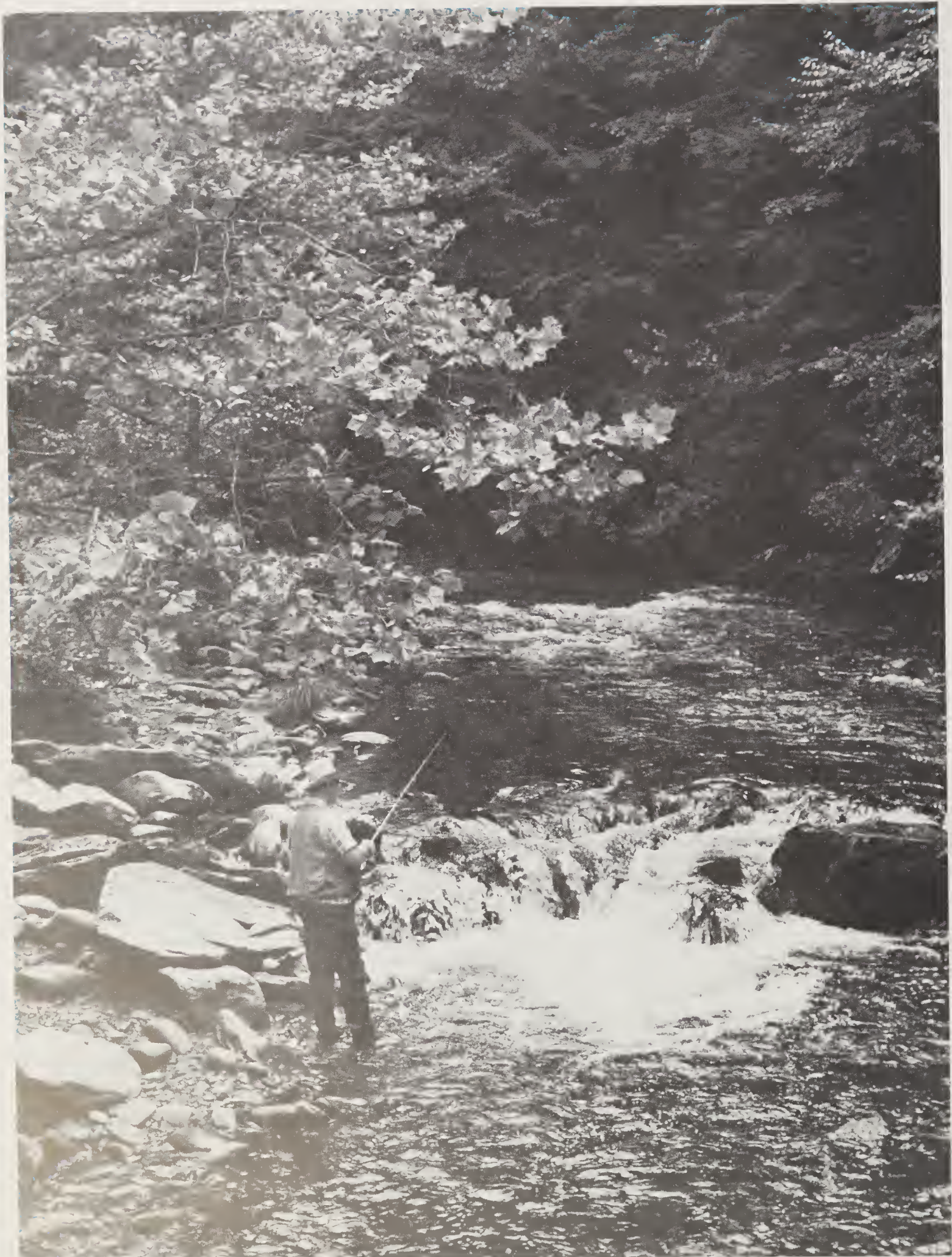
Livestock
Grazed
9.9 Million
Animal Unit
Months

Mineral
Cases
Processed
2,304

Insect and
Disease
Suppression
1.4
Million
Acres

Reforestation
61.3
Acres

Timber
Harvested
1.2 Billion
Board Feet



Chief's Message

I am pleased to report to you on the state of the Forest Service and our accomplishments during fiscal year 1987. We listened to the American people, and tried to better reflect their views and thoughts in our management of the 191 million acres of national forest and grasslands. Our efforts have resulted in many successes.

Again this year, we worked hard on completing forest plans — 85 of 123 are now complete. These plans provide for balanced management of the national forests with increased emphasis on fisheries, wildlife and recreation management, as well as the continued importance of timber, grazing, and mining.

During 1987 we set an all-time record of 12.7 billion board feet of timber harvested on the national forests. We also developed an expanded accounting system which presents a more accurate picture of the costs and benefits of our timber sale program. The Timber Sale Program Information Reporting System (TSPIRS) displays this information through individual financial, economic, and socio-economic reports.

The National Forest System contains the greatest diversity of fish and wildlife of any single ownership in the Nation. Through our research we learned much more about wildlife needs and requirements. We studied those species most likely to be impacted through forest management activities such as wildlife associated with old growth habitat and those listed as threatened or endangered.

The Challenge Cost-Sharing program for wildlife and fishery habitat improvement was a tremendous success! The fishery and wildlife community supported the national forests with matching funds and volunteer labor to step up the pace in fish and wildlife habitat improvement. Enthusiasm was high and "matching" contributions exceeded \$2.6 million. Through these cost-sharing partnerships with approximately 200 cooperators, coupled with \$1.5 million in Forest Service funding, we improved habitat for deer, elk, salmon, trout and other species on the national forests.

Last year, we also began "Rise to the Future — Fish Your National Forests," a program to aggressively integrate fish habitat management into our overall national forest management. Again, we developed cooperative partnerships with interest groups, individuals, and agencies. We made great strides in meeting our wildlife habitat management goals.

Recreation management also received increased visibility during 1987, a year in which our National Recreation Strategy was changed. We recognize our responsibility as a major provider of outdoor recreation in the United States. As we enter 1988, we are moving toward a new strategy to meet the changing needs of the American people through partnerships, joint ventures, and cost-sharing projects similar to those in our wildlife programs.

We have also looked internally for new and innovative ways to manage day-to-day Forest Service business. In 1985, we began the National Pilot Study aimed at changing the traditional bureaucratic approach to business. Last year, we expanded the study to include more of the Forest Service. Through flexibility in basic

policy, budget allocation by appropriation rather than line items, and application of savings to other priority work, we have significantly streamlined bureaucratic processes while improving productivity and morale. The simplified budget allocation process proved to be especially useful, and we are currently working with Congress to simplify the entire Forest Service budget process in a similar manner. The success of the Pilot Study has attracted the attention of other public and private organizations. In 1987, we shared our experience with many of these agencies, including NASA, the CIA, the Veterans Administration, and the Federal Executive Institute. We will continue the Pilot Study and anticipate continued strong outside interest in the project.

We ended an already busy year with the "fires of September." Lightning storms across California and Oregon brought about one of the most severe fire situations ever experienced on National Forest System lands, requiring the largest mobilization of personnel and equipment ever undertaken by the agency. Some 25,000 people united to fight nearly 2,000 fires which burned over 800,000 acres during the siege. Tragically, twelve firefighters lost their lives in the suppression effort. Only the outstanding cooperation among Federal, State and local agencies kept this disastrous situation from becoming even worse.

As an integral part of our effort to include the American people in forest management, we have developed "Forests For Us," a communications campaign designed to actively involve the American people in caring for the land through volunteerism. The program is aimed at helping people learn more about and appreciate the many benefits the forests provide. The Forest Service is also a major partner and supporter of the Take Pride In America program. I believe these programs have the potential to create a greater understanding and appreciation of the Nation's natural resources that we all depend upon to meet our needs.

We had a very good year, and I look forward to an even greater 1988 with continued progress in meeting the changing needs of the American people.



F. Dale Robertson
Chief



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Introduction



CARING FOR THE LAND AND SERVING PEOPLE

Our Mission

We care for the Nation's forests and rangelands. We serve the needs of the people who own them. In short, we strengthen the Nation for future generations—and we are proud of our role.

The Forest Service is a leader in the conservation and wise use of the Nation's forests and rangelands. We manage 156 national forests, 83 experimental forests and ranges, 19 grasslands, and 16 land utilization projects. We cooperate with the States in helping private landowners apply good forest practices on their lands, and we do research to find better ways to manage and use our national resources.

A Proud Heritage

Our Conservation Philosophy. On February 1, 1905, President Theodore Roosevelt signed the Act transferring the Nation's forest reserves from the Department of the Interior to the Department of Agriculture. That same day, Secretary of Agriculture James Wilson endorsed Gifford Pinchot's conservation philosophy of wise use and service to the American people. The forest reserves, later renamed the national forests, were to be managed for the greatest good for the greatest number of people in the long run. Local questions were to be decided by local officials—a philosophy that has made the Forest Service one of the most decentralized and responsive agencies in the Federal Government. So the Forest Service has been committed from its very beginning to working closely with local people while responding to national interests and needs.

Values and Principles. Early forestry leaders like Theodore Roosevelt and Gifford Pinchot combined vision with action. Their principles and philosophies helped mold Forest Service values and culture that have stood the test of time—conservation leadership, public service, responsiveness, integrity, a strong land ethic, and professionalism characterized by people who know their jobs and do them well. These values and principles are the bedrock on which the Forest Service stands—

they will support us as we adapt to, and thrive on, change and challenge.

The Future—Strengthening the Nation

The Forest Service is committed to our tradition of strengthening the Nation and increasing its wealth—our economic, environmental, and spiritual wealth. Our forests and rangelands are true national treasures. We appreciate the beauty and bounty of these lands. We will keep them healthy and productive. We will keep the air and streams clean and the fish and wildlife abundant for the use and enjoyment of our Nation's people.

Natural Resource Management. The Forest Service will cooperate with our many partners to improve management of the Nation's forest and rangeland and all of their resources.

We have a special responsibility to manage the 191 million acres of national forests and grasslands as models for multiple-use sustained-yield management. We are committed to wise use and balanced consideration of all natural resources. We will follow a conservation philosophy that will bestow to future generations the opportunities we now enjoy. These include high-quality water, wood, and paper for homes and hundreds of other uses, forage for wildlife and livestock, wilderness and outdoor recreation for enjoyment and relaxation, quality habitat for many plants and animals, and a source of important minerals.

Research will continue to expand the scientific basis for forestry, range, and natural resources management. We will make significant progress in key areas, such as acid rain, insect and disease control, wildlife habitat, wood utilization, and ways to better manage forests and rangelands for all of their values. We will share this knowledge and experience to improve both the Nation's and the world's forests and rangelands.

Public Support and Trust. The years ahead will be challenging. Many people care about, and have often-conflicting needs and concerns about how these lands should be managed. All citizens of the

United States are “stockholders” in the lands we manage and the research we produce. Their views and thoughts are important in everything the Forest Service does. They are also entitled to an equitable share of the benefits our forests can produce.

We will work hard for broad public understanding, trust, and confidence in what we do. We can earn this by giving quality public service, communicating accurately and openly with the public, and being attentive to public needs and values. We will be good neighbors and good hosts. We will support our partners and work with them in a spirit of cooperation to achieve balanced natural resources management.

Our Greatest Strength—Our People. Recognizing that our greatest asset is our people and that our greatest strength lies in our performance, we will become a more effective and productive organization. We will promote a management climate which fosters teamwork, esprit de corps, innovation, creativity, common sense, and the open expression of ideas. We will experiment with and test new ideas, fully recognizing that some will not work, but adopting those that do.

We will have a work force that better reflects the national diversity. Every individual is important in achieving the overall mission of the Forest Service. We will keep our employees informed and promote a strong sense of purpose.

Finally, we will strive to make each person's work interesting, challenging, rewarding, and fun—more than just a job!

LEGISLATIVE DIRECTION

The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended, directs the Secretary of Agriculture to prepare a comprehensive, long-range assessment of the Nation's renewable resources and to develop a program for Forest Service activities.

The RPA requires the Secretary to submit an annual report to Congress on Forest Service accomplishments and progress in carrying out the RPA Program. This report covers fiscal year 1987.¹

¹ Unless otherwise stated, all references to years in this report are fiscal years.

Report of the Forest Service Fiscal Year 1987

Required in the annual report are the following:

- A description of the status of major research programs, significant findings, and ways these findings will be applied in programs.
- A description of the cooperative forestry assistance programs, and their accomplishments, status, needs, and work backlogs.
- A report on the progress of incorporating mandated standards and guidelines into the land management plans for units of the National Forest System.
- A summary of estimated expenditures—on a representative sample basis, for reforestation, timber-stand improvement, and the sale of timber from the National Forest System—compared to the return to the Government from such timber sales.
- An identification, on a representative sample basis, of advertised timber sales made below the estimated expenditures mentioned above.

This document includes other reports that Congress requires at the time of the annual report. These are as follows:

- A report identifying the amount and location, by Forest, State, and productivity class, of (1) all lands in the National Forest System where land management plans have indicated the need to reforest areas that have been cut over or otherwise denuded or deforested, and (2) all lands with stands of trees that are not growing at their best potential.
- An estimate of the funds needed to successfully replant an acreage equal to the acreage to be cut over that year.
- A report on the amounts, types, and uses of pesticides used in the National Forest System, including the beneficial or adverse effects of such uses.

In addition to requirements of the Act, this Report reports on accomplishments and outputs in relation to commitments in the appropriate Forest Service budget.

National Forest System



INTRODUCTION

The Forest Service manages and protects the 191 million-acre National Forest System—an area nearly as large as the 14 Eastern States from North Carolina through New England to the Canadian border.

The natural resources on these lands are among the Nation's greatest assets, affecting the economic, environmental, and social well-being of all Americans.

The national forests:

- Are a storehouse of nearly half the softwood sawtimber in the United States and a supply for 15 percent of the annual wood volume harvested.
- Provide habitat for nearly 60 percent of the animal species in the country, including 140 threatened or endangered species.
- Furnish three-quarters of the West's water supply, and a good share of the East's.
- Contain 128,000 miles of streams and 2.2 million acres of lakes and reservoirs—important water-based recreation opportunities and fisheries habitat.
- Are the single largest Federal supplier—42 percent of the total—of outdoor recreation in the Nation, more than a quarter million visitor-days a year.
- Include over 84 percent of the Nation's National Wilderness Preservation System—more than 32 million acres in the 48 contiguous States. One acre in six of the National Forest System is in designated wilderness.
- Contain nearly one-quarter of our potential energy reserves, and hold unique deposits of some critical minerals, including about 14 percent of the world's known lead, and 25 percent of its molybdenum.
- Manage nearly 100 million acres of forage in 35 States for wildlife, domestic livestock, and wild, free-roaming horses and burros.
- Return 25 percent of receipts to State governments for funding public schools and roads in counties where the national forests are located.

Managing the National Forests is a complex business with many opportunities to influence the Nation's natural resources and economic de-

velopment. Debate today over how these priceless assets should be managed is not much different than in Gifford Pinchot's time seven decades ago—trying to decide what is the fair share of the resources to be distributed to meet the Nation's needs and demands. The "fair share" today is being addressed through the agency's Forest Land and Resource Management Plans, which integrate for management the many resources of the national forests. The following sections describe how the Forest Service is implementing the National Forest Land and Resource Management Plans to further our strong tradition of caring for the land and serving people.

LAND MANAGEMENT PLANNING

The Planning Process

The Forest Service uses the land management planning process to determine the best use of all resources on the 191 million acres of the National Forest System, including recreation, fish and wildlife habitat, water, timber, minerals, range, and wilderness. This integrated planning process stems from the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). The process not only helps managers determine the best use of these resources, but also helps them respond to current demands in a way that ensures that adequate supplies will always be available.

Land management planning is a continuing process that responds to changes in the demands made upon the supply of renewable resources. The Forest Service, in cooperation with the public, will update and amend forest plans as needed to ensure that adequate resources will be available for future generations.

Regional Guides

All nine regional offices have published final regional guides and environmental impact statements required by NFMA. Included in the guides are major issues and management concerns of the region, as well as tentative resource objectives recommended by RPA for each na-

tional forest. While the guide ensures that a consistent approach to national forest planning is followed throughout the region, it allows managers on the individual forests considerable latitude in formulating forest plans. The guide also helps coordinate National Forest System programs with State and Private Forestry and Research programs.

Status of Forest Plans

A total of 123 forest plans are being developed under NFMA. The Washington Office has reviewed drafts of all 123 plans, except the Tongass National Forest, which is not scheduled for revision until 1989. During 1987, 20 forest plans were finalized, bringing the national total to 85; however, three of these were not published before the end of the year. Five plans were prepared in draft during the year, bringing the current total of plans in draft form to 37. This includes three plans that were prepared in draft and reviewed by the Chief's Office, but require additional analysis.

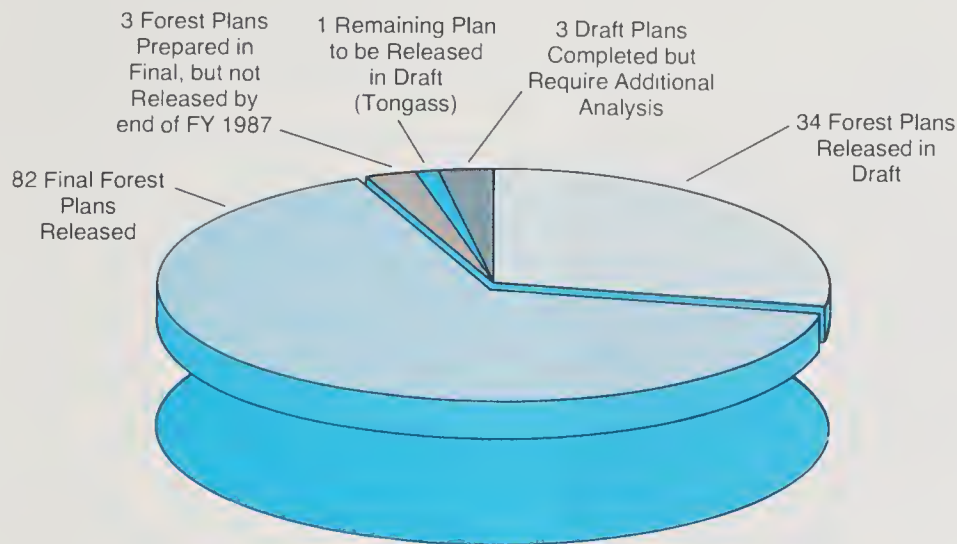
Table 5 lists the draft and final forest plans and environmental impact statements (EIS's) prepared to date.

Status of Appeals

The appeals process provides an opportunity to have a decision reviewed by a higher Forest Service organizational level. This process enables persons to object to decisions in the forest plans and to see that the objections are reviewed fairly and objectively. Approximately 430 appeals have been filed on forest plans, of which 202 have been resolved. At the close of 1987, 24 forest plans had been cleared of all appeals.

The Pacific Northwest Regional Guide is the only regional guide that was appealed. The Secretary's office remanded the guide for additional analysis and preparation of a supplement to the guide to determine how much old-growth timber must be protected to ensure viability of the northern spotted owl. The draft supplement was published in August 1986 and made available for public review and comment. Approximately 40,000 written comments were received on the draft supplement. The final supplement is

Status of Forest Plans



expected to be released in February 1988.

Wilderness Legislation

At the beginning of calendar year 1987, there were approximately 32 million acres of wilderness in the National Forest System. Another 21 million acres of roadless areas are being reviewed for their wilderness potential. The latter figure includes congressionally mandated wilderness studies on about 6 million acres in 26 States.

Several pieces of wilderness legislation are pending for various States, including Montana, Idaho, Nevada, and California. Just as 1987 came to a close, a Michigan Wilderness bill (approximately 91,535 acres) was enacted. Two other bills—Virginia Wilderness (approximately 27,687 acres) and Montana Wilderness (approximately 1.3 million acres)—passed the House of Representatives.

Wild and Scenic Rivers

Legislative and administrative work for proposed Wild and Scenic Rivers was very active during 1987. Congressional hearings were held on bills to designate three rivers in California for inclusion in the National Wild and Scenic Rivers System—the Merced (114 miles), the Kings (81 miles), and the Kern (151 miles). These bills were enacted in November 1987, increasing the

number of miles in the System to 7,709, of which 2,404 miles are administered by the Forest Service.

Legislation also has been introduced to designate segments of the Rio Chama (31 miles) in New Mexico and the Greenbrier (133 miles) in West Virginia.

Congressionally authorized studies were completed on the Sipsey Fork (90.9 miles) in Alabama, the Red River (19.4 miles) in Kentucky, and the Greenbrier River (131 miles) in West Virginia. Other congressionally authorized studies are continuing on the Allegheny in Pennsylvania, the North Umpqua in Oregon, and the White Salmon and Klickitat in Washington.

Through the forest planning process, a total of 458 rivers on national forest lands have been evaluated for Wild and Scenic River eligibility. Tentative results include 45 rivers recommended for designation, 183 for further study by the Forest Service, and 19 for study by other agencies. Many of these rivers were identified as having outstanding values in the National Rivers Inventory (National Park Service, 1982). Some national forests are making Wild and Scenic Rivers suitability determinations in the forest plans, while others have deferred further study until plan completion.

The Forest Service also has taken the initiative to study the Henry's Fork in Idaho, the Little Bighorn in Wyoming, and the Nolichucky in North Carolina. The Ozark-St. Fran-

cis and Ouachita National Forests in Arkansas are initiating forest-wide studies of 16 rivers identified as eligible for Wild and Scenic Rivers status in the forest plans.

The Northern Region is completing an extensive Wild and Scenic River eligibility determination for national forest rivers in Montana and Northern Idaho. Those rivers found to be eligible will be studied further to determine if they should be recommended for Wild and Scenic River designation.

GEOMETRONICS

Geometronics literally means "measuring the earth." Traditionally, it has encompassed the fields of cartography, aerial photography, and photogrammetry. With advances in technology, it now includes automated cartography, digital terrain analysis, remote sensing, orthophotos, and geographic information systems. These tools are critical for today's land and resource management activities of the Forest Service. The Geometronics program is performed by three organizational entities: the Geometronics Service Center (GSC), a production group in Salt Lake City; a unit in each of the nine Regional Offices; and a Washington Office development group.

The Geometronics Service Center's primary mission is to produce the Primary Base Series maps, Secondary Base Series maps, and orthophotos for all Forest Service administered lands, in support of resource management needs. This provides the map base needed by field personnel for inventory and display of resource and other thematic information. In cooperation with the U.S. Geological Survey (USGS) and other mapping agencies, GSC produced 1,392 Primary Base maps, 57 Secondary Base maps, and 919 orthophotos.

The regional geometronics groups are an integral part of the base series mapping program, coordinating updates to the maps and handling printing and distribution. They also directly support the forests' special project needs, with surveying, photogrammetric support, data collection, special-purpose maps, and other graphic products.

The development group in Washington deals with national policy and standards and includes working with other agencies to coordinate



The Wild and Scenic Rivers System totals 7,710 miles in length.

programs. It also develops computer software and processes. The software that generates the standard format for terrain data exchanged with the USGS resulted in cost savings of 35 percent for complete coverage of forest lands.

MINERALS

Energy-producing resources found beneath National Forest System lands include oil, natural gas, coal, geothermal steam, and uranium. Minerals of strategic importance beneath these lands include platinum, palladium, chromium, nickel, tungsten, and molybdenum. Gold, copper, zinc, silver, and phosphate also

are found in significant amounts.

Forest Service minerals management ensures that the mineral resource is developed in a manner compatible with the management of other resources. The Agency cooperates with the Department of the Interior to ensure coordination in the management of Federally owned minerals within the National Forest System. The Forest Service also works with State and local agencies in the management and development of private minerals estates.

In 1987, total receipts from rents, royalties, sales, and bonus bids for minerals totaled an estimated \$149.6 million, \$29.4 million more than in 1986. Increased receipts for

1987 resulted from higher output production from existing oil, gas, and coal leases.

During 1987, 25,104 mineral cases were processed, exceeding the funded target by 9.4 percent and the RPA recommended level by 1.4 percent (table 6). These cases involved leasable, locatable, and salable minerals. They included such activities as processing new lease applications, completing validity examinations, processing prospecting permits, approving and administering operating plans, and issuing and administering geophysical permits and mining proposals for private minerals estates.

Some of the increase in the minerals management work was the result of leases being turned back and reoffered because of the changed oil market. Activities related to gold and platinum-group metals continued to increase in 1987. The number of cases remaining unprocessed at the end of the year decreased from 2,363 in 1986 to an estimated 1,571 in 1987 (table 7). Of the unprocessed cases, 830, or 53 percent, were cases in areas where the Forest Service is precluded from acting upon them. In particular, these include areas being considered for wilderness and restricted under the appropriations act or where wilderness studies are not yet complete.

The mineral withdrawal review required by the Federal Land Policy and Management Act of 1976, Section 204(1) (43 U.S.C. 1714), is about 60 percent complete. This review involves 1,980,000 acres of National Forest System lands. There are 1,681 separate withdrawals that affect 6,150 individual sites. The Forest Service review will be completed in 1989 and will be incorporated into the Secretary of the Interior's report to the President, which is scheduled for 1991.

On December 22, 1987, the President signed the Budget Reconciliation Act including Subtitle B—Federal Onshore Oil and Gas Leasing Reform Act of 1987. The Forest Service's responsibility and authority for oil and gas leasing and on lease operation have been increased as follows: The Secretary of the Interior can issue an oil and gas lease on National Forest System land only when the Forest Service does not object. The Forest Service is now responsible for the administration of all surface-disturbing operations

which includes approval and compliance inspections and enforcement. In addition, the National Academy of Sciences will conduct a study of the manner in which oil and gas resources are considered in land use plans.

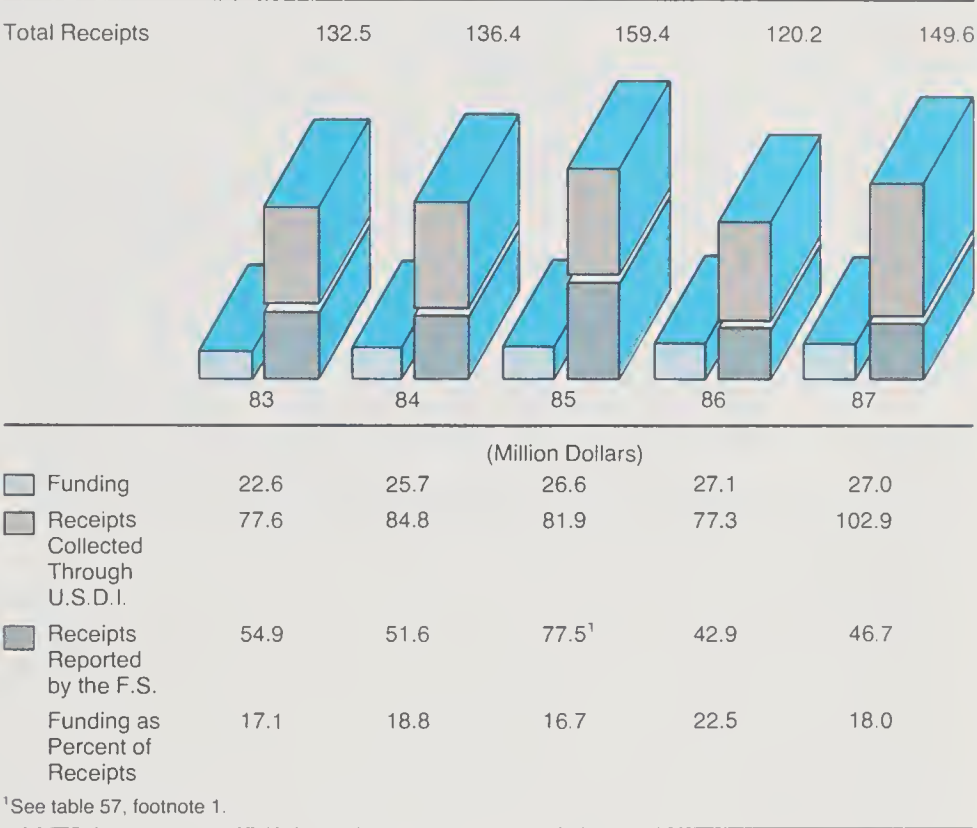
LANDS

Landline Location

In 1987, the Agency used the \$27.0 million appropriation to locate a total of 5,250 miles of property boundary, 11 percent more than the funded target of 4,717 miles. The Forest Service was able to exceed planned targets primarily because of efficiencies gained through advances in technology and procedures.

Accurate location of landlines—the legal boundaries between National Forest System lands and other ownerships—is essential for managing and protecting these lands from encroachment. The RPA recommended level is to locate, mark, and post all National Forest System

Minerals—Funding and Receipts



Private industry operations on NFS land returned \$149.6 million to the U.S. Treasury in 1987 from rents, royalties, sales and bonus bids.

property boundaries by the year 2020. Of the total 272,409 miles of National Forest System property boundary, 85,421 miles were completed by the end of 1987.

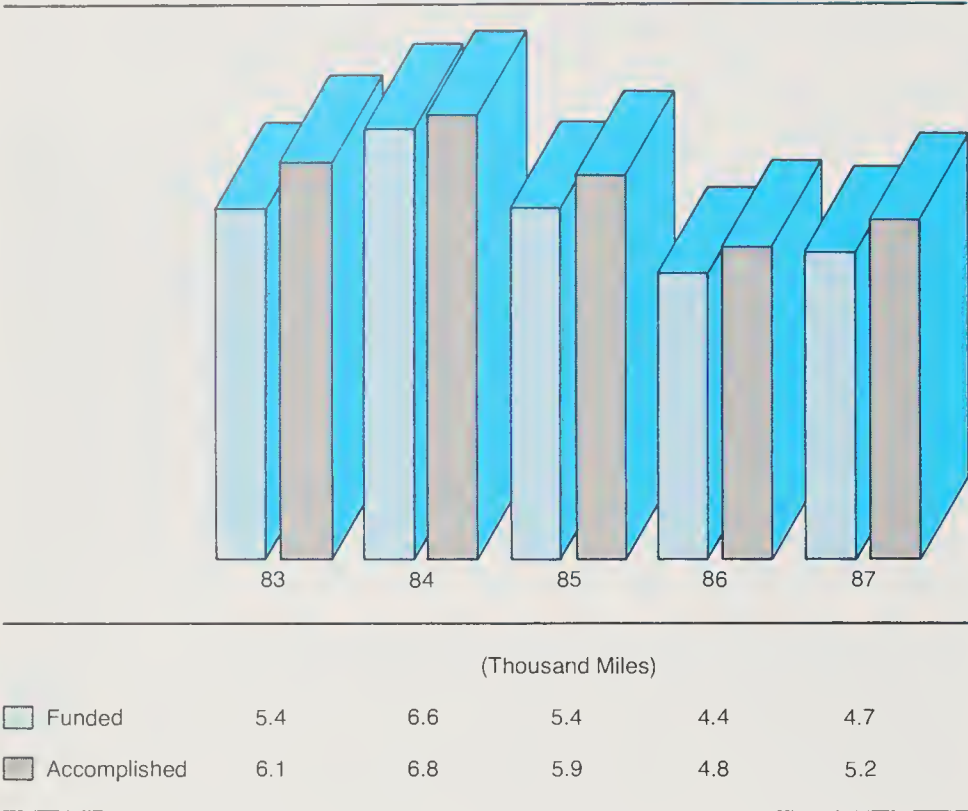
Land Exchange

In 1987, 134,757 acres of non-Federal land were acquired in exchange for 90,157 acres of National Forest System land. As a result of completing several large acreage exchanges and emphasizing exchanges as the preferred alternative to purchase, more than 100 percent of the planned land exchanges were completed.

These exchanges consolidated National Forest System lands, making it more efficient to manage and administer various resource programs. For example, these land exchanges served to reduce national forest property lines by more than 1,400 miles in 1987. This is expected to save about \$8 million in future landline location costs, or more than 1½ times the \$5.2 million cost of the exchange work. additional savings will result from fewer trespass cases, fewer special-use permits, and fewer rights-of-way cases in future years.

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Landline Location Accomplishments



Much of the non-Federal land acquired through land exchanges is within classified Wilderness Areas, National Recreation Areas, Wild and Scenic Rivers, National Trails, and other congressionally designated areas. In each case, it was more cost effective to exchange lands than to purchase them. In 1987, non-Federal landowners paid \$938,400 in cash equalization payments, and the United States paid \$130,600. The total amount (\$1.07 million) was less than 2 percent of the appraised land value.

Small Tracts Act Cases

The Small Tracts Act of 1983 authorizes the Secretary of Agriculture to sell or exchange certain small parcels of National Forest System land. Included are unmanageable parcels of various sizes and shapes located between mineral patents, as well as small parcels innocently occupied (for example, where a private home has been inadvertently built over a National Forest System property line). Since February 1984, when regulations to implement the act became effective, 655 cases, most involving encroachments, have been resolved. In all, 920 acres of Federal land have been conveyed,

897 acres of non-Federal land have been acquired in interchanges and \$862,500 has been paid to the United States. Of the 655 cases, 203 were resolved in 1987.

Land Purchases and Donations

The Forest Service purchased 104,859 acres of land and interests in land with money provided from the Land and Water Conservation Fund, receipts acts and other appropriations. In addition, landowners donated 132 acres of land and interests in land to the National Forest System.

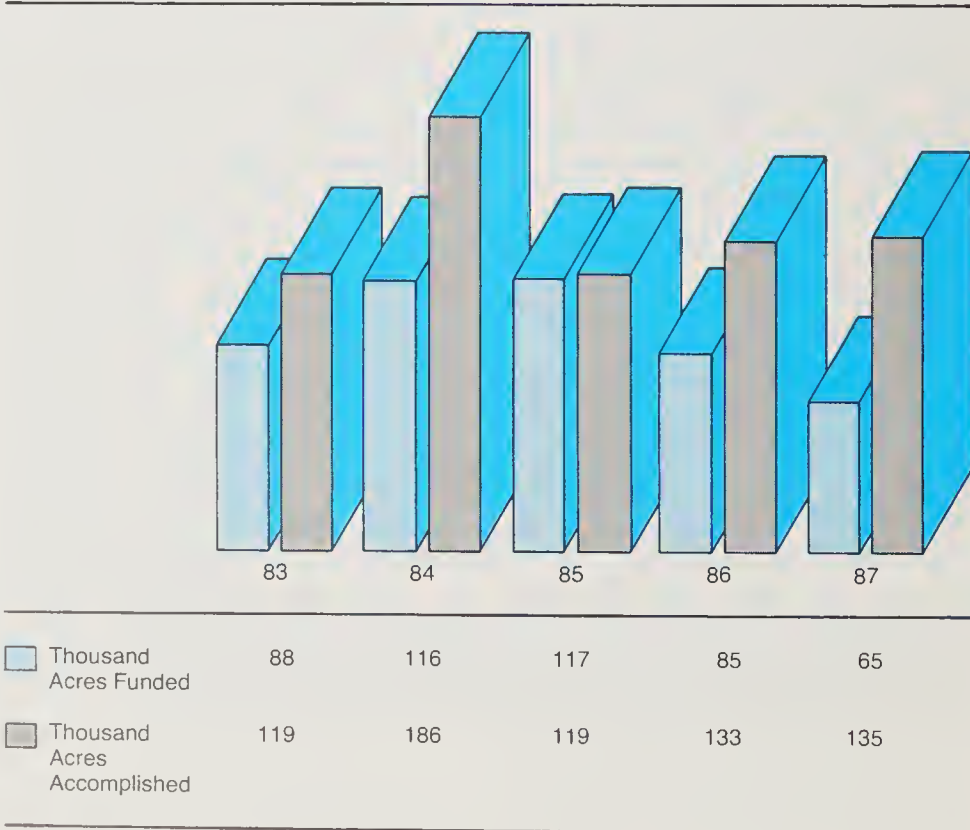
Road Rights Of Way

As a result of 633 separate transactions in 1987, the Forest Service acquired more than 397 miles of road rights of way, including 308 miles of existing roads, at a cost of \$403,000. Ownership of these rights will improve or protect access to the National Forest System for all users.

LAW ENFORCEMENT

Forest Service responsibility for law enforcement is directed at protecting natural resources, Federal

Land Exchange Accomplishments





property, employees, and visitors on the national forests. Major law enforcement investigative activities in 1987 covered wildland arson, timber theft, cannabis eradication, internal investigations, theft of artifacts, and destruction of archeological sites.

The Forest Service participated with the Federal Drug Enforcement Administration, Department of Justice, and State and local agencies in

the detection and eradication of illegally cultivated cannabis. The major concern with cannabis production is the risk to national forest visitors, contractors, and employees when they encounter those who are tending or guarding these lucrative crops. Reducing the use of the national forests for cannabis production is essential to maintain a safe environment for all users of the National Forest System.

In order to curb marijuana growth and preserve the safety of forest visitors, the Forest Service implemented specialized training during 1987 for many of their law enforcement officers. The extreme fire season in the Western United States destroyed many marijuana plants, and prevented officers from fully participating in an eradication program.

The loss of cultural resources to vandalism, digging for artifacts, ille-

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gal construction, and theft is still of great concern on National Forest System lands. The Forest Service has been investigating and prosecuting artifact cases since the mid-1970's. Special agents and law enforcement officers have been directly involved with many convictions in several States under the Archaeological Resources Protection Act.

The Cooperative Law Enforcement Program is designed to compensate local law enforcement agencies for protecting visitors and their property in national forests. Funding has been concentrated in national forest areas where large numbers of visitors must receive their principal protection from relatively small, understaffed local law enforcement agencies. Wherever it has increased the law enforcement presence, this program has reduced criminal acts to visitors and their property.

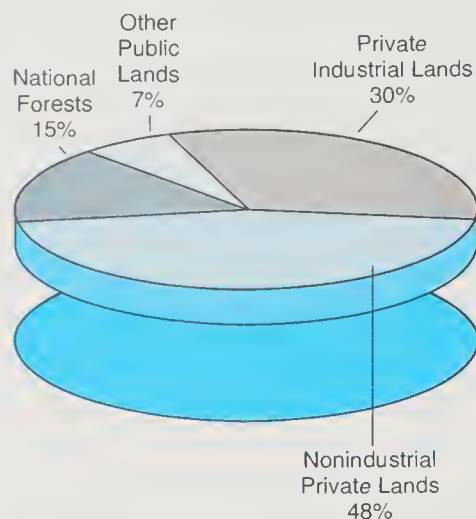
TIMBER

Program Overview

The Forest Service manages the national forest timber resources to help ensure a continuing supply of timber products for America's needs. The timber products include logs for lumber and plywood, wood fiber for paper, fuelwood, posts, poles, and Christmas trees.

In 1980, national forests had the largest inventory of standing softwood sawtimber in the Nation, esti-

Percentage of Total Annual Wood Harvested for Lands in the United States



mated at nearly one trillion board feet. This was about 51 percent of the national total. Nonindustrial private forest lands accounted for 21 percent of the total; private industry had 16 percent; and other public lands had 12 percent.

National forests provide about 15 percent of the total wood volume harvested annually in the United States. This compares to about 48 percent from nonindustrial private forest lands, 30 percent from lands owned by industry, and 7 percent from other public lands.

During 1987, the Agency's accomplishments in relation to 1987

funded targets were 102 percent for timber offered for sale, 98.3 percent for reforestation, and 95 percent for timber-stand improvement (TSI).

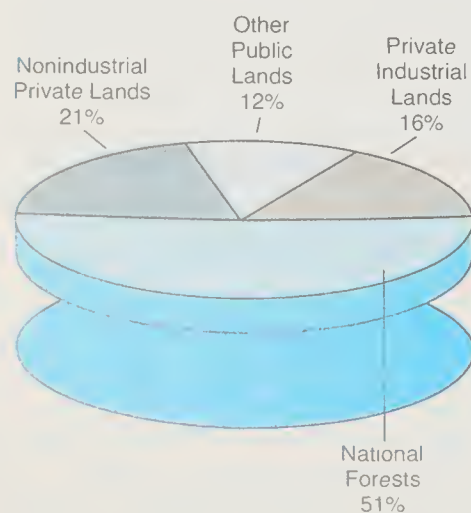
Compared with the recommended levels established in the 1985 RPA program, the 1987 accomplishments were as follows: 115 percent for timber offered, 116 percent for reforestation, and 103 percent for timber-stand improvement.

The Forest Service's timber management program continues to bring in more money than it spends. In 1987, the cost of the timber management program was \$478.6 million (table 18). The value of timber harvested in 1987 was \$1.016 billion (table 12).

Timber Sale Preparation, Offering, and Harvest

The timber sale program goal for 1987, as directed by Congress, was to prepare and offer for sale 11.2 billion board feet. The Forest Service actually offered 11.5 billion board feet, and it sold 11.3 billion board feet. The primary reason for offer accomplishment exceeding funded targets was the reoffer of sales defaulted in previous years. The value of timber sold was \$1.003 billion. This compares to 1986 sales of 11.0 billion board feet valued at \$757 million. The average bid for timber in 1987 was \$89 per thousand board feet, compared to \$69 in 1986, \$52 in 1985, and \$66 in 1984. The increase in average bid reflects, in part, the continuing upturn in timber demand.

Inventory of Standing Softwood Sawtimber Percent by Ownership



Summary of Timber Sale Buy-Out Returned and Reoffered Volume

Region	No. of Sales	Total Volume Returned (MMBF)	Total Buy-Out Charges Billed (\$ thousands)	Volume Reoffered in 1986 (MMBF)	Volume Reoffered in 1987 (MMBF)	Total Volume Reoffered to Date (MMBF)
1	112	665	9,108	132	144	276
2	13	33	328	5	5	10
3	26	166	1,758	16	49	65
4	17	40	464	2	30	32
5	226	1,997	43,009	293	337	630
6	991	6,627	112,718	1,798	1,579	3,377
8	136	202	2,607	69	80	149
9	57	18	185	4	9	13
10	0	0	0	0	0	0
Total	1,578	9,748	170,177	2,319	2,231 ¹	4,550 ¹

¹ Columns do not sum due to rounding. Totals shown are National totals.



Helicopter removing logs from a harvest unit—harvest volume in 1987 reached an all-time record of 12.7 billion board feet.

The harvest volume for 1987 reached an all-time record of 12.7 billion board feet, compared to 11.8 billion board feet in 1986. The previous record harvest of 12.4 billion board feet occurred in 1973. The value of timber harvested in 1987 was \$1.016 billion, compared to \$787 million in 1986.

Because of upward market trends, the volume of uncut timber under contract decreased to 25.1 billion board feet in 1987, compared to 25.98 billion board feet in 1986. The volume under contract includes sales conditionally extended as well as the volume from unresolved defaulted sales. It also includes some sales whose status remains unresolved during Title 7 bankruptcy proceedings. Long-term sale volume is included in the total as it is released for cutting.

Under the Federal Timber Contract Payment Modification Act (FTCPMA) of 1984, timber purchasers returned 1,578 sales containing 9,748 million board feet. In 1987, 2,231 million board feet was reoffered for sale. To date, 4,550 million board feet have been reoffered.

Salvage Sale Program

The salvage sale program was authorized under the National Forest Management Act of 1976. It allows the Forest Service to use money from salvage sales to cover the cost of preparing and administering the sale of insect-infested, dead, damaged, or downed timber, and engineering work necessary for the roads needed for these sales.

In 1987, the Forest Service sold approximately 856 million board feet of salvageable timber through the salvage sale program. This represents about 85 percent of the total salvage volume sold. Small timber operators with less than 25 employees purchased about 12 percent of the timber sold under the salvage sale program.

Major salvage sale offerings occurred as a result of fire and blow-

down in the Pacific Northwest and California, and from the mountain pine beetle outbreaks in the northern Rocky Mountain area.

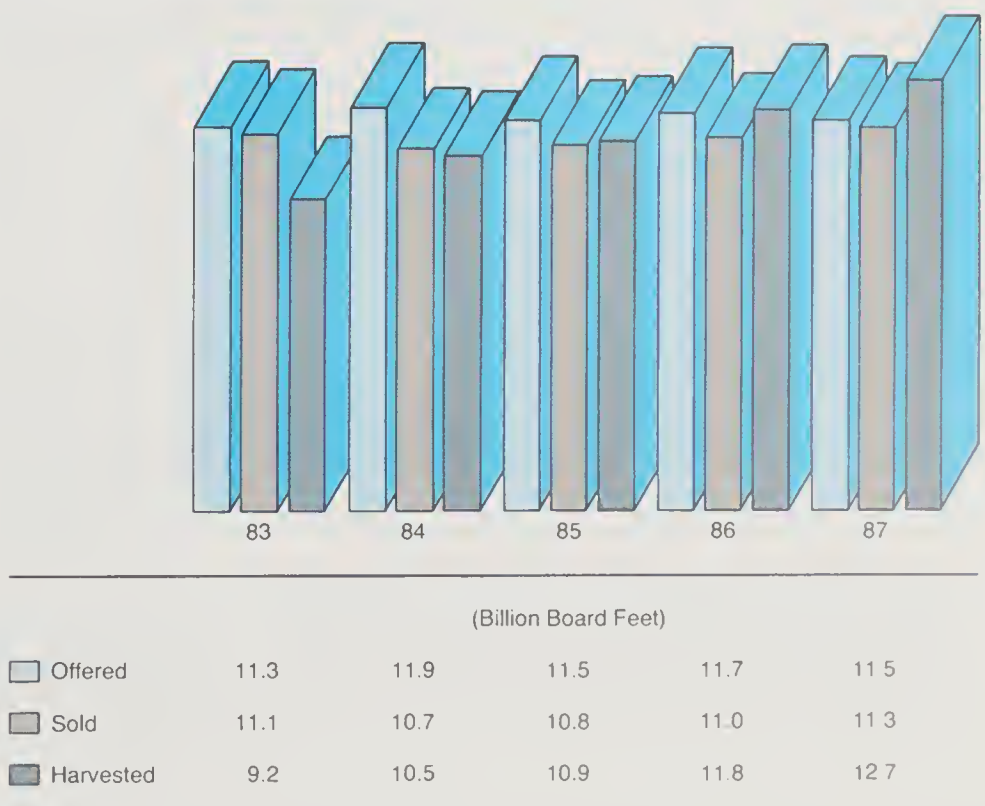
Fuelwood

The amount of fuelwood removed from National Forest System lands continued the decline begun in 1982. In 1987, the equivalent of 1.6 million cords of fuelwood were sold or provided for free use, compared to 2.0 million cords in 1986, 2.4 million cords in 1985, and 2.7 million cords in 1984. The decline reflects both decreasing demand resulting from lower prices for oil and gas and the continuance of a charge permit program instead of the free-use program on most forests. It is believed that the decrease in fuelwood consumption may also be related to higher employment levels, and less discretionary time available to obtain fuelwood.

Timber Sale Program Information Reporting System (TSPIRS)

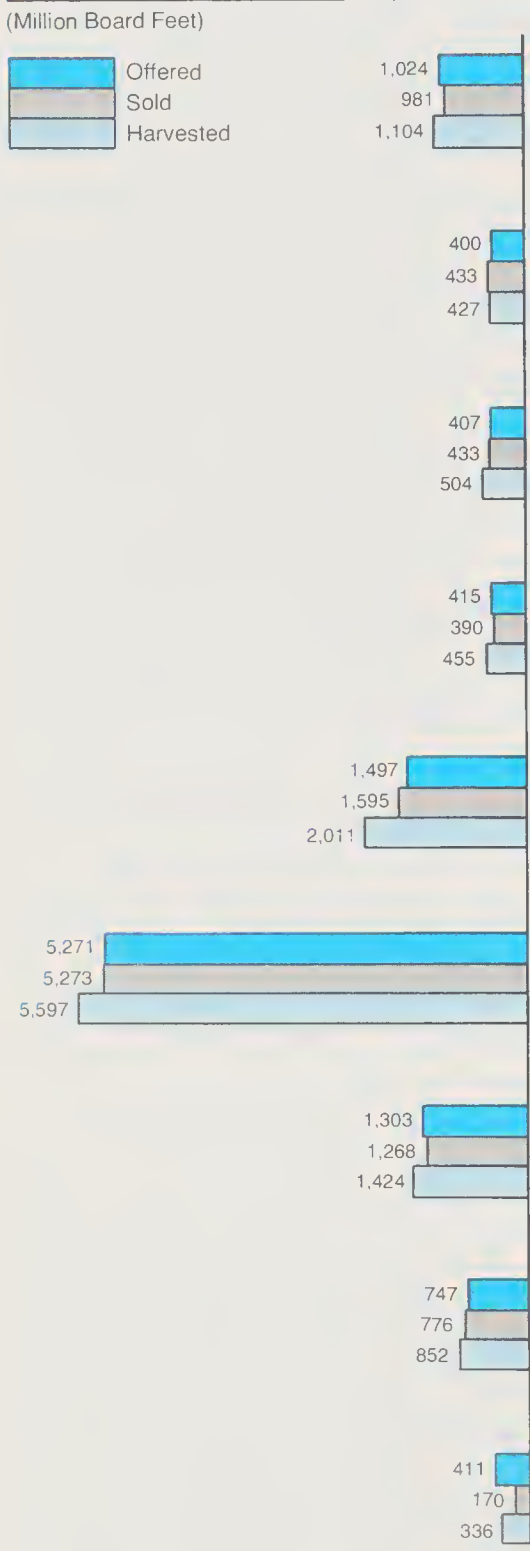
Following the direction from the Congressional Appropriations Committee's 1985 Conference Report, the Forest Service established a task

Timber Offered, Sold and Harvested

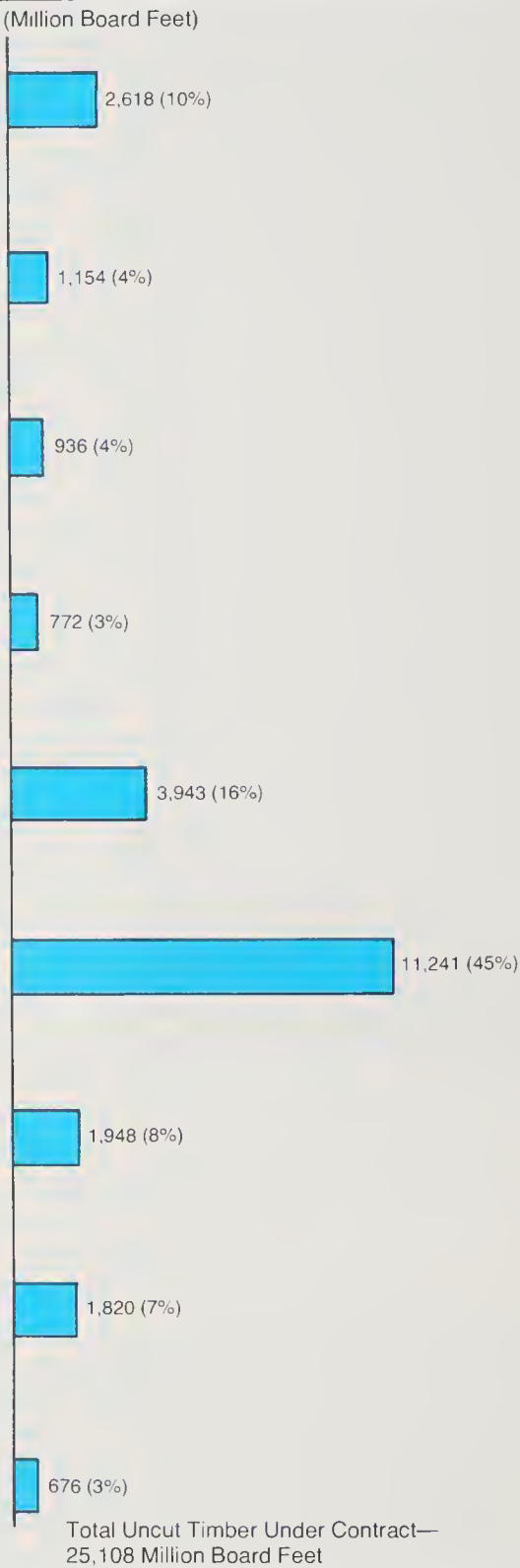


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Timber Offered, Sold and Harvested



Uncut Timber Volume Under Contract



force to develop, field test, and evaluate accounting and display options for the costs and benefits of the timber sale program. A final report presenting the Timber Sale Program Information Reporting System (TSPIRS) was delivered to Congress in April 1987.

This final report reflects, among other things, a revised financial accounting system developed in conjunction with the General Accounting Office (GAO). In response to a separate request by the House Appropriations Subcommittee on Interior, GAO independently established baseline costs and accrual accounting procedures that they believe Congress and the Forest Service should have for the timber sale program. TSPIRS incorporates the concepts of the GAO accounting procedures in addition to other important economic information about the annual sale program. No single financial report can present all the information needed to understand the costs and benefits of the timber sale program. Therefore, TSPIRS contains three basic reports to display this information.

- Report 1: A financial report, as presented in the GAO report to Congress.
- Report 2: An economic report displaying the long-term costs and benefits, including both market and nonmarket values, associated with the annual timber sale program.
- Report 3: A socioeconomic report presenting the effect of employment, income, and program output levels on local communities.

The Forest Service is proceeding with implementation of TSPIRS. In 1987, 12 national forests implemented the system. During 1988, the system design will be refined on the test forests with the aim of fully implementing the system on all national forests in 1989. As currently designed, the system will provide the financial, economic, employment, income, and program level perspectives important in assessing a forest's annual sale program. Some potential applications for TSPIRS in managing the national forest timber sale program are in the areas of

HOW VALUES ARE CALCULATED

Value of Timber Products Sold. The value of timber products sold is an estimate of the amount the Forest Service expects to receive from the timber sale, based on the bid rates. It does not include purchaser credit—the value of permanent roads built by purchasers. It includes all types of sales, products, and tree species.

Value of Timber Products Harvested. The value of timber products harvested is the adjusted amount paid by the purchaser at the time of harvest. The value does not include purchaser credit. The value of timber harvested from a sale may differ from the bid value because of price adjustment provisions in the contract and differences between estimated and actual volumes.

Money Received From Timber Products. Money that the Forest Service receives from the sale of timber products varies from reported harvest value because of the time delay between billing and receipt of payment.

stewardship reporting, public information, accountability, forest plan monitoring, timber sale planning, and programming. Performance testing and implementation will examine these applications for TSPIRS to assist in shaping future Forest Service policies.

Silvicultural Examinations

The silvicultural examination is the process for obtaining site and

stand characteristics needed to identify existing stand conditions, capabilities, and trends. In 1987, 5.2 million acres were examined in this program. Data from silvicultural examinations are used in developing site-specific prescriptions to meet multiple-use objectives on national forests. Silvicultural examinations also provide essential basic timber data for use in implementing the forest land and resource management plans.



Silviculturist checking growth response in thinned stand

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Reforestation

In 1987, about 394,000 acres of National Forest System land were reforested—the highest number of acres reforested since 1981. Of this total, 139,000 acres were reforested using appropriated and Reforestation Trust funds, while 255,000 acres were funded by money set aside from timber sales under the Knutson-Vandenberg Act (K-V) (tables 19-21). This was a record amount of reforestation accomplished through K-V funding. The strong economy in recent years has increased the rate of timber harvest activity, which, in turn, has created more cutover lands needing reforestation with K-V funds.

Even though the Forest Service reforested more land in 1987 than in 1986, the increase in reforestation was outpaced by the increase in acreage needing to be reforested. At the close of 1987, about 1.1 million acres needed reforestation—up nearly 30 percent from last year. This increase occurred primarily because of record high timber harvesting levels nationally, the extreme wildfire damage in California and Oregon, and a severe bark beetle outbreak in northeastern Utah.

Over the last 5 years, an average of 88 percent of all reforestation treatments have successfully met stocking objectives. In 1986 (the latest year for which data is available), success was 91 percent. This was about 5 percent above 1985, which had been reduced by the severe drought in the Southern States and portions of the Intermountain West.

The average cost of all reforestation in 1987 was about \$353 per acre (appropriated \$343 and K-V \$359). The 1987 cost was about 8 percent more than in 1986, reflecting slightly higher contract bid prices.

Timber-Stand Improvement (TSI)

A total of 357,000 acres received TSI treatment. Appropriated funds and the Reforestation Trust funds were used to treat 223,000 acres; K-V funds were used on an additional 134,000 acres (tables 22-24).

Several types of noncommercial treatments can improve timber-stand growth or quality. Indeed, the future useable yield of timber stands can be increased anywhere from 15 to 25 percent with treatments such as thinning overly dense stands, eliminating competing shrubs or weed

trees (referred to as "release"), or applying fertilizer to stimulate tree growth. As of October 1, 1987, TSI treatment has been prescribed for about 1.2 million acres. This includes reforested stands that may need thinning or release to maintain a healthy, vigorous condition.

The average cost of all TSI treatments in 1987 was about \$140 per acre, a slight decrease from 1986. The cost of TSI funded by K-V decreased 23 percent to \$144 per acre because the highest cost regions accomplished a smaller percent of the job. Loss of personnel for firefighting led to a reduction of K-V TSI accomplishment and a corresponding reduction in expenditures.

Tables 20 through 26 provide detailed information on needs, accomplishments, and the certification of reforestation and TSI.

Forest Tree Improvement

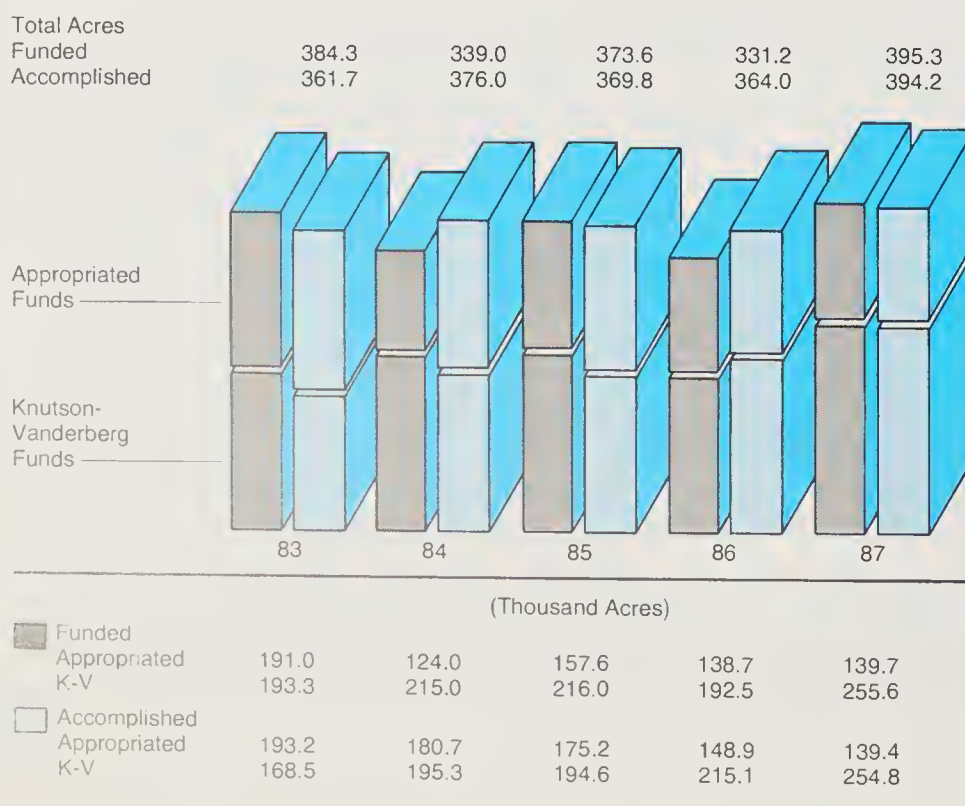
The tree improvement program is designed to select trees with superior growth or disease-resistance characteristics as breeding stock to produce seed for improved seedlings for the Forest Service planting program. Timber yields should be at least 10 percent greater on lands reforested with genetically improved planting stock. During 1987, 33 percent of the acres artificially regenerated were planted with improved seedlings grown from seed orchard seed.

The Forest Service selected more than 2,200 superior trees, planted 1,258 acres of seedling tests to evaluate the genetic worth of the selections, and established 117 acres of seed orchards to produce improved tree seed. More than 27,600 pounds of seed were harvested in seed orchards this year, accounting for 58 percent of the total amount of seed collected.

Inventory and Planning

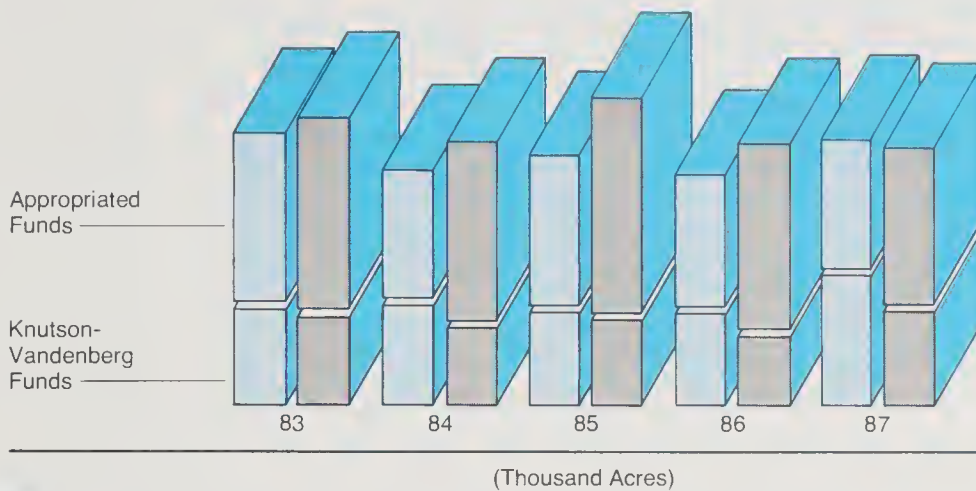
The Forest Service annually inventories approximately 10 percent of its forested land base for timber information. This information, together with information about other forest resources, is used in the development of forest plans under the National Forest Management Act planning process and in the RPA assessment. Under this process, each of the 123 national forest units establishes new allowable sale quan-

Reforestation



Timber-Stand Improvement

Total Acres					
Funded	374.7	323.7	346.4	319.3	368.2
Accomplished	397.6	361.6	421.4	360.1	356.9



Funded					
Appropriated	235.0	181.7	214.4	188.4	185.8
K-V	139.7	142.0	132.0	130.9	182.4
Accomplished					
Appropriated	270.6 ¹	250.1	300.5	259.4	222.7
K-V	127.0	111.5	120.9	100.7	134.2

¹ Does not include 158,000 acres accomplished with Federal Emergency Jobs Bill funds.

ties (volume of timber that may be sold for harvest) and outlines timber management activities for the next 10 to 15 years.

The Heli-Stat Project

The final report on the Heli-Stat Project was completed by Aerospace Inc. in September 1987. The report shows that the Heli-Stat concept has utility as a heavy-lift vehicle. Aerospace Inc. is conducting another study for the Department of Defense which includes comparisons between the Heli-Stat, Cyclo-crane, Magnus, and other heavy-lift vehicles. The Forest Service will review these reports to determine whether these vehicles may have application for forest management. Other than the reviews mentioned above, the Heli-Stat Project is completed.

RECREATION

The national forests provide the most diverse spectrum of opportunities and record the largest amount of recreation visitor use on Federal lands. They include 84 percent of the Wilderness System in the 48 contiguous States. The trail system is

the largest in the Nation, with more than 102,500 miles of trails to hike or ride. National forests include 2,404 miles of the Wild and Scenic Rivers System, 13 National Recreation Areas, and many more geologic, scenic, and botanical areas. National forests encompass many valuable historic and prehistoric archaeological resources. Developed facilities include more than 4,400

campgrounds and 1,400 picnic grounds. National forests provide information and interpret these valuable opportunities at 50 major visitor centers. In cooperation with the private sector, the national forests provide more than 40 percent of the downhill ski opportunities in the Nation as well as quality services in lodges, resorts, and more than 15,000 vacation cabins.

Many national forests provide wildland recreation opportunities within a 1-hour drive of such major metropolitan areas as Los Angeles, Boston, St. Louis, Washington, D.C., Houston, Phoenix, Denver, Seattle, Portland, and Salt Lake City. General outdoor recreation use patterns reported by the President's Commission on Americans Outdoors show an increase in the number of visits to areas close to home. As these trends continue, recreation resources near major cities will play an increasingly important role in offsetting the stresses of modern society.

Recreation Use

In 1987, 238.5 million Recreation Visitor Days (RVD's) occurred on National Forest System lands, a 5 percent increase from the prior year. The 1987 use was within 11 percent of the RPA projection (table 4).

More outdoor recreation occurs on National Forest System lands than on any other Federal landholding. Recent data show that the national forests and national grasslands account for 42 percent of the total



Private outfitters and guide services provide unique opportunities to enjoy the national forests.

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RVD's of use that takes place on Federal lands.

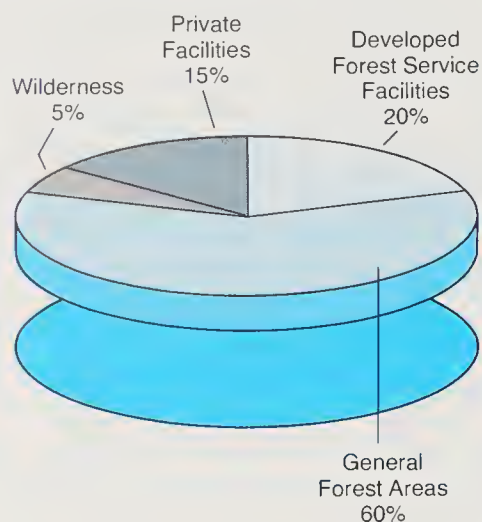
National Forest recreation includes a wide spectrum of activities. Access to these activities is provided on 344,000 miles of road and extensive trail systems for motorized and nonmotorized vehicles (tables 27 and 28.)

In 1987, visits to national forest campgrounds, picnic areas, and swimming sites were the equivalent of 68.1 million RVD's. This amounted to about 29 percent of total National Forest System recreation use. Facilities operated by other public agencies or the private sector on National Forest System lands, such as ski areas and vacation cabins, accounted for an additional 13 percent of total visitation.

Most national forest visitors used these lands for unstructured, dispersed recreation, like hiking, hunting, and driving for pleasure. This use accounted for an equivalent of 140 million RVD's, or about 59 percent of total use. This demonstrates the continued popularity of the less confined and unregulated recreation opportunities. Of the total use, 13.0 million RVD's occurred in wilderness and primitive areas.

In 1987, recreation use increased by 5 percent over 1986. While there are no absolute figures to support

Where Recreation Occurs on National Forests



reasons for the increase, it may be due to improved economic conditions, fear of travelling abroad because of terrorism, increased public awareness of recreation opportunities enhanced by the report of the President's Commission on American Outdoors, and an abundance of gasoline for vehicle travel.

Improved public information efforts were implemented to provide better use of the many outdoor rec-

reation opportunities and to redistribute users from overcrowded facilities. The Forest Service and the Travel for Tomorrow Council conducted a media campaign, "Room to Roam." This is the second year for the campaign designed to encourage more efficient distribution of use by showing potential visitors the many recreation opportunities available, often in the lesser known areas.

Receipts

Total recreation receipts in 1987 were \$30.6 million. Expenditures for recreation were \$113.3 million. Fees, therefore, recovered 27.0 percent of total recreation costs.

Fees for use of national forest recreation facilities generated \$11.1 million in 1987, compared to \$10.9 million in 1986 and \$12.1 million in 1985. This fluctuation was partially caused by the leasing of many Forest Service campgrounds by the private sector under the Concession Campground Program. Fees for recreation special uses, derived primarily from ski areas and recreation residences, generated \$19.4 million, a slight increase from \$19.3 million in 1986.

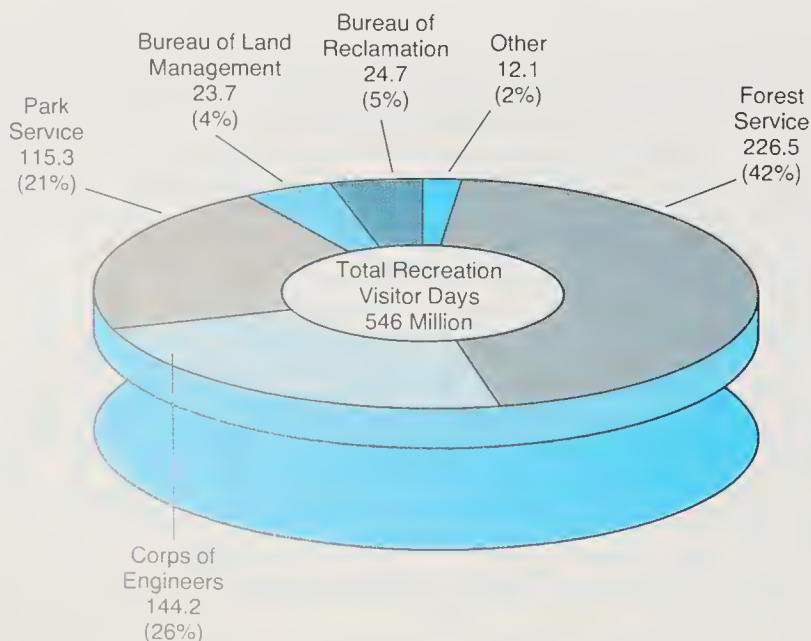
In calendar year 1987, interpretive associations contributed an estimated \$1 million to the national forests from gross sales of \$2.5 million, primarily from book and map sales. Interpretive associations are nonprofit, public service organizations established to further the interpretation and understanding of resource management on the national forests. Direct services of these associations include visitor center staffing, map and book sales, preparation of an array of publications, and purchase of equipment for interpretive programs.

Trails

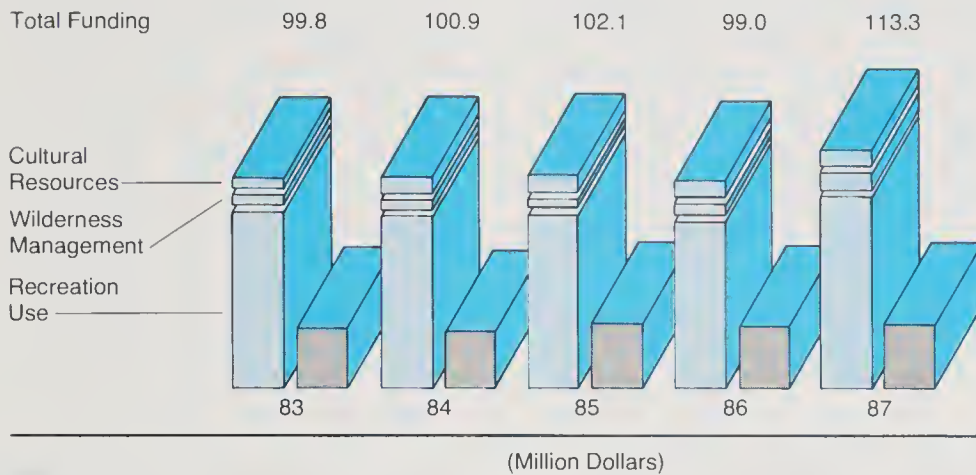
The national forest trail system provides opportunities for horseback riders, hikers, motorcyclists, snowmobilers, bicyclists, and disabled visitors. The trail system also is used to access such resource management activities as wildfire suppression and wildlife habitat improvement (table 29). We constructed or reconstructed 868 miles of trails, compared to the funded target of 730 miles and the RPA target of 502 miles. Most of this work

1986 Recreational Visitor Days by Federal Agency

(Million RVD's)



Recreation—Funding and Receipts



Funding					
Cultural Resources	6.7	9.4	9.6	9.3	9.7
Wilderness	7.2	6.8	7.8	7.5	10.3
Recreation Use	85.9	84.7	84.7	82.2	93.3
Receipts	27.8	27.5	30.8	30.3	30.6
Receipts as Percent of Funding	27.9	27.3	30.2	30.6	27.0

was reconstruction of existing trails, rather than new construction. In addition, 178 miles were constructed or reconstructed through the contributed efforts of volunteers, the Youth Conservation Corps, the Senior Community Service Employment program, and others. Currently there is a backlog of \$100 million in needed trail reconstruction or maintenance. This backlog has resulted from increased use, weathering, and postponing of routine maintenance.

The total trail system now has 102,500 miles, an increase from 95,348 in 1975. We have been building new trails and reconstructing existing trails to take advantage of scenic vistas and historic sites, to create loop trails, and to provide diverse experiences. The administrative trail system was not designed for recreation needs. Today, however, trail use accounts for 8 percent of total national forest recreation use and is a cost-efficient recreation capital investment.

Recreation Facility Management

Historically, as national forests became more heavily used, recreation facilities were built to protect resources and settings as well as to

accommodate visitors. These facilities include campgrounds, trailheads, boat ramps, picnic areas, and visitor information centers. The majority of facilities are more than 20 years old.

These recreation facilities have a combined capacity for 158 million persons-at-one-time (PAOT) days. PAOT days are determined by multiplying a site's designed capacity for people-at-one-time by the number of days per year that a site is available for use. In 1987, the Forest Service provided 108 million PAOT days, with another 17 million PAOT days contributed by human resource programs. The total figure, 125 million PAOT days reflects a continuing decrease in operating capacity over previous years. The decrease is related in part to deferred facility maintenance.

Deferring maintenance increases the need for repairs and reduces the quality of a facility. As a result, portions of facilities may be closed temporarily to reduce costs. Such closures are deemed necessary to prevent deterioration resulting from public use and thereby extend the life of a facility. To the extent that deterioration related to weather and other factors continues, the life of the facility is shortened and the value of the asset is depreciated.

Deferred maintenance is established at \$297 million of the \$4 billion Federal investment. This backlog represents a serious risk of loss of a major capital investment in recreation facilities. Backlog figures have plateaued in recent years because of closures and congressional



Convenience, efficiency and lower fees for campground visitors highlight the national forest Camp Stamp program.



Recreation opportunities on the national forests are as varied as the seasons.

appropriations. The 1985 RPA program recognizes this need.

Recreation Site Construction

In 1987, Congress appropriated \$17.0 million for recreation construction. The majority of these funds were used for the following projects: Mount St. Helens facilities, WA; repair of flood-damaged facilities on the Monongahela National Forest, WV; Clear Creek Recreation Area, AL; and Ravens Cliff (Mt. Rogers National Recreation Area), VA. The balance provided for high-priority recreation facility rehabilitation projects, with emphasis on health and safety-related projects such as water and sanitation reconstruction. An objective of this rehabilitation is to increase receipts and recreational opportunities.

Cultural Resource Management

The Historic Preservation Act of 1966 directs the Forest Service to identify and protect significant cultural resource properties during such

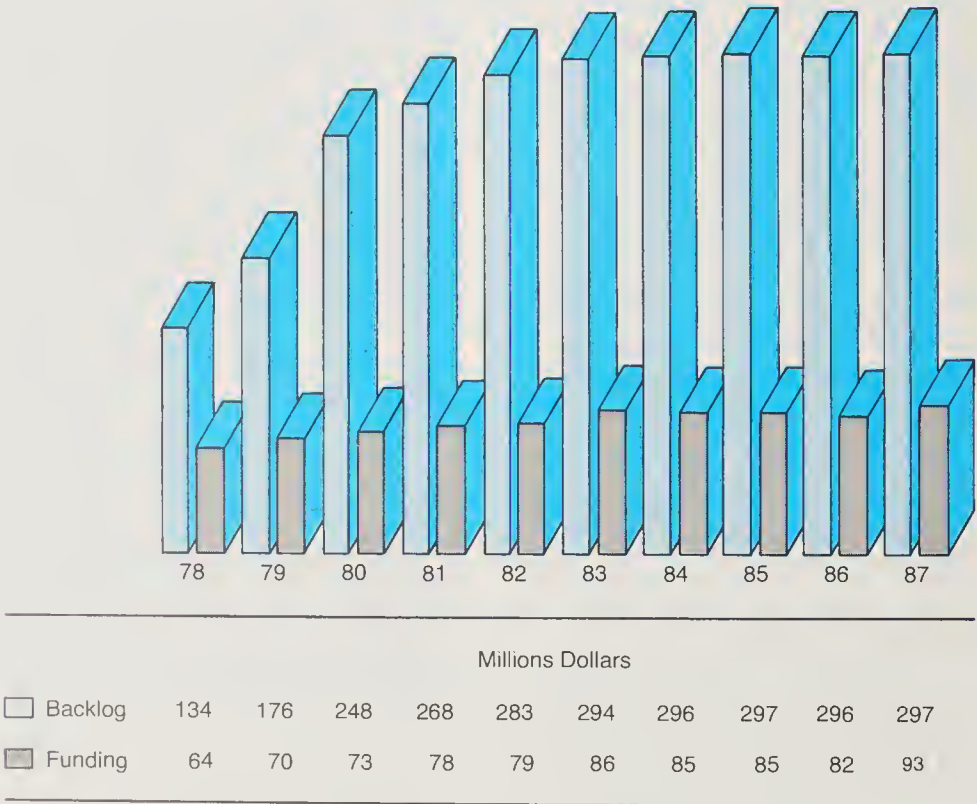
land-disturbing activities as road-building, campground construction, and timber harvest. To meet this direction, archeological surveys are conducted before proposed projects are approved. This year, survey sampling was accomplished on 2.4 million acres. These surveys identified significant properties that have cultural, prehistorical, or historical resources. Of the 2,008 properties evaluated, 71 are now on the National Register of Historic Places, and an additional 982 are deemed eligible for listing.

Mount St. Helens National Volcanic Monument

Construction of the Visitor Center building was completed for the formal dedication on December 13, 1986. During 1987 more than 600,000 people visited the new 16,000 square-foot building. Through the nonprofit Northwest Interpretive Association, these visitors bought \$175,500 worth of books and other items. The building and interpretive exhibits have been universally applauded by national and international visitors.

Road construction occurred on Forest Road 99 inside the Monument during the summer of 1987.

Recreation Rehabilitation Backlog



WILDERNESS

There are currently 348 national forest wildernesses in 35 States. These areas total 32.5 million acres, 1 acre for every 6 acres in the National Forest System.

The goal in managing wilderness is to protect wilderness resources, provide for wilderness use, and reduce conflicts between the uses and the values of wilderness. These values include opportunities for solitude and for experiencing the land

This double-lane paved road, running along the east side of Spirit Lake south to Windy Ridge parking and viewpoint, was half completed by early November. During the construction period, the contractor supplied a visitor shuttle bus service, which carried 89,000 visitors.

Use of the Monument decreased during the summer because of road construction, but greatly increased in the winter. A new mountain climbing program on Mount St. Helens started in May 1987. More

than 15,000 climbers participated in this popular program between May and the end of the climbing season on October 1.

Funding was provided to build more than 16 miles of new trails on the Monument. The Forest Service accelerated construction of the central section of the Windy Ridge viewpoint into the late fall of 1986, and this project was completed before snowfall. A contract to relocate the Ape Cave parking area also was awarded in 1987.



Wilderness areas, such as the North Absaroka Wilderness on the Shoshone National Forest, provide opportunities for solitude and primitive recreation.

Report of the Forest Service Fiscal Year 1987

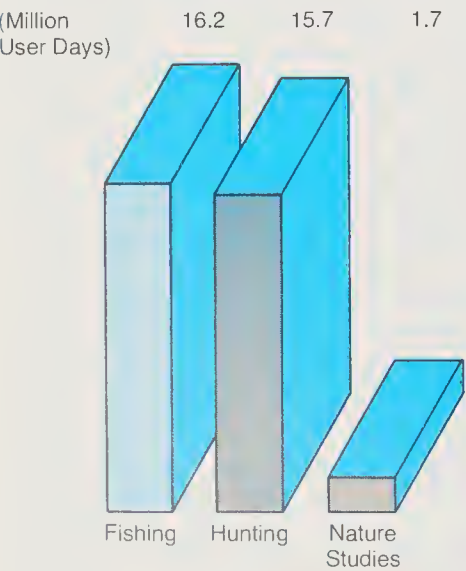
in its primeval character, as well as ecological and geological features of scientific, educational, or historical importance.

Recreational use of wilderness and primitive areas totaled 13.0 million RVD's, up from 1986, when use was 12.0 million RVD's.

WILDLIFE AND FISH

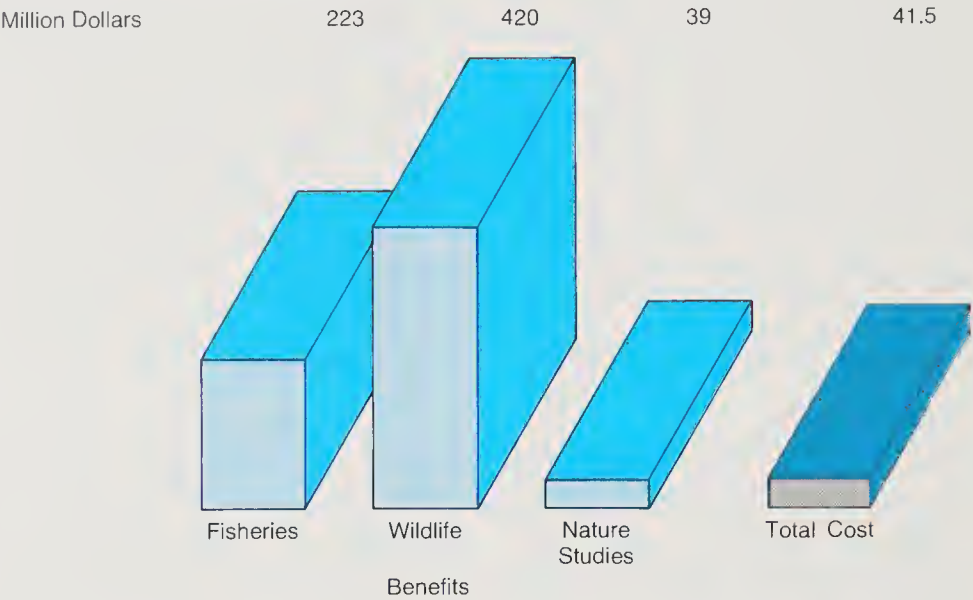
The National Forest System contains the greatest diversity of wildlife, fish, and plant species and communities of any single land ownership in the country. We manage plant and animal habitats on National Forest System lands and cooperate with State agencies in managing animal populations on these lands. Wildlife and fish program plans, developed jointly with 43 States under the Sikes Act, are part of the forest planning process. Goals are to maintain ecosystem diversity and productivity, and to meet demands for recreational and commercial uses of fish and wildlife as part of overall multiple-uses.

1987 Wildlife and Fish User Days



Wildlife and fish resources of the National Forest System provided nearly 33.6 million user-days of recreation for hunters, fishermen, bird-watchers, and others. (These are included as RVD's in the recreation use figures in tables 27 and 28.) This represents about 14 percent of all recreation on national forests. According to RPA planning information, the value of hunting provided on national forests is estimated at

Wildlife and Fisheries Benefits and Costs in 1987



\$420 million and the value of fishing at \$223 million. Congress appropriated \$42.5 million in 1987 for management to sustain and increase these benefits.

Habitat management sustains biological diversity of the Nation's major forest reserve system. Focus is on recovering threatened or endangered species; maintaining viable populations of all native vertebrates; protecting special habitats, such as old growth, riparian, trout streams, snags, and wetlands; and ensuring productivity of selected species, such as elk, deer, turkeys, bass and salmon, for recreational and commercial uses.

Wildlife and Fish Habitat Improvement

During 1987, we managed habitats to maintain current levels of wildlife and fish production in concert with other resource programs. Many forest plans call for increases in wildlife and fish habitat productivity to meet growing demands for recreational, commercial, or subsistence uses.

Appropriated funds were used to improve 124,138 acres of habitat, which was 114 percent of the funded target. Most of this was accomplished through mitigation of impacts associated with other resource activities. Prescribed burning, which provides benefits for many species through renewal of food plants, accounted for most of the

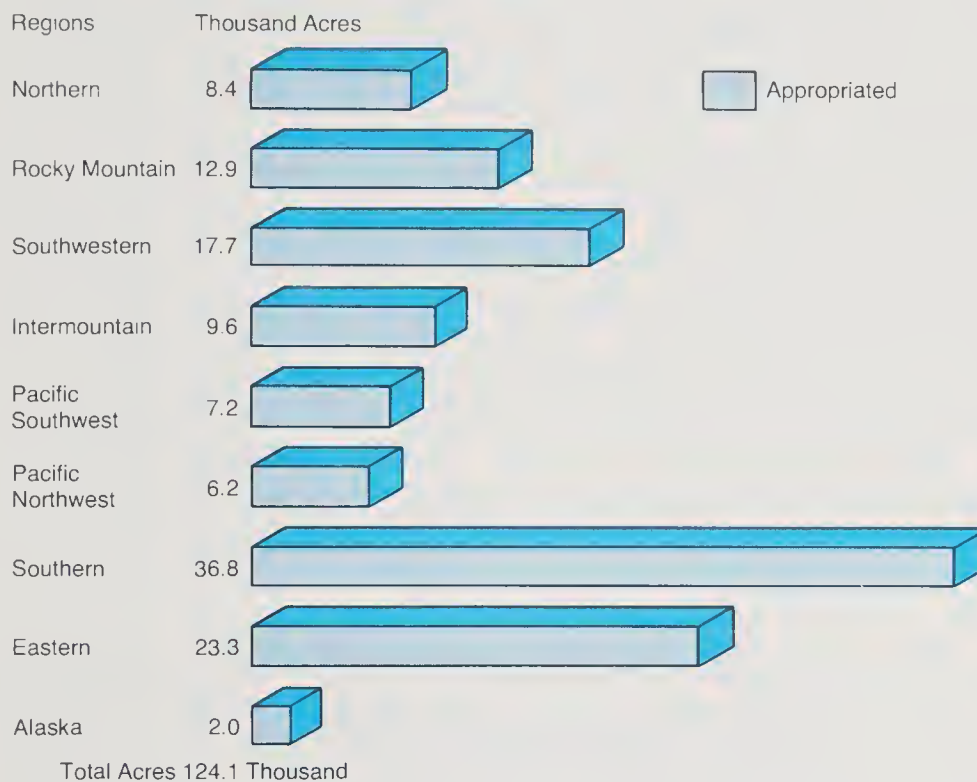
habitat improved, particularly in the Southern Region.

Knutson-Vandenberg funding from timber harvest receipts—a significant source of funds for wildlife and fish habitat management—is also used to maintain or improve the quality of habitats in areas affected by timber harvest.

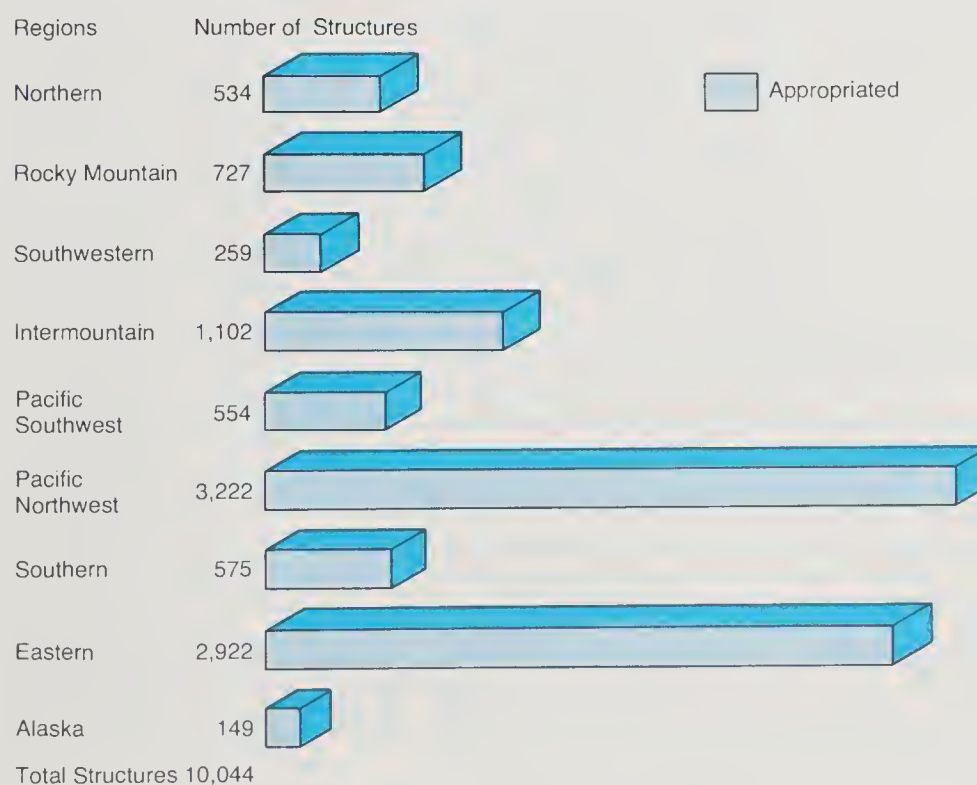
Following are examples of habitat improvement activities accomplished in cooperation with States and other Federal agencies:

- During 1987, a cooperative wildlife management area was established under the authority of the Sikes Act in the Southwestern Region, in cooperation with the Bureau of Land Management and the New Mexico Department of Game and Fish. This agreement provides that funds generated from the State sales of a mandatory \$5.25 stamp, which is required to hunt, fish, or trap in the area, must be used for habitat improvement on lands in the program. These lands include the entire Lincoln National Forest in New Mexico and a comparable acreage of adjacent Bureau of Land Management lands. An additional 170,000 acres of the Carson National Forest also are included. It is expected that the program will generate approximately \$200,000 per year. Planned habitat improvement projects include streamside habitat enhancement, spring development, water catchments, and stream improvements for fisheries. This agreement establishes a prec-

Wildlife and Fisheries—Acres of Habitat Improved



Wildlife and Fisheries—Structures Completed



edent in local and State funding for management on National Forest System lands.

- In cooperation with the Fish and Wildlife Service and the Arizona Game and Fish Department, the Forest Service made an experimental release of thick-billed parrots into historic habitat on the Coronado National Forest in Arizona. The birds were acquired from illegal imports confiscated by Customs agents and captive-reared stock donated by parrot breeders. More than 40 birds were successfully released into the wild. This species had been extinct in Arizona for many years.

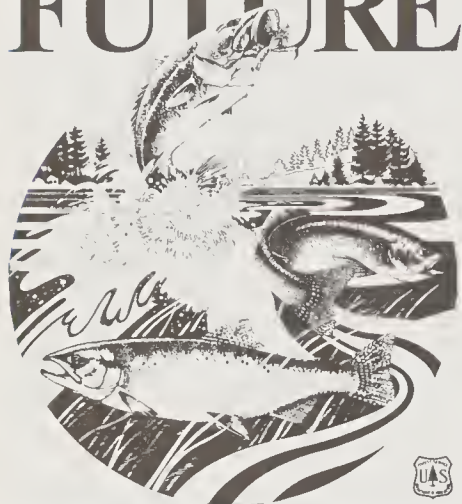
"Rise to the Future—Fish Your National Forest," a fisheries renewal program, was implemented in 1987. It aggressively integrates fish habitat management into the overall multiple-use goals of national forest management to help meet the projected doubling in fisheries demand over the next five decades. Protecting and restoring aquatic habitat, in concert with well-designed projects to improve habitat, will greatly increase habitat productivity and angling opportunities and commercial fishing, too. For example, the capability exists to increase salmon and steelhead spawned and reared on national forests by 72 million pounds, with direct economic value of more than \$100 million per year and more than 10,000 jobs.

Partners in Habitat Improvement: The Challenge Cost-Share Program

Congress authorized \$1.5 million in 1987 to continue the fish and wildlife Challenge Cost-Share program on national forest lands. All regions participated and developed partnerships with conservation groups, such as the National Wild Turkey Federation, the Rocky Mountain Elk Foundation, and Trout Unlimited; private individuals; and public agencies. Approximately 200 cooperators pooled their financial and human resources. Cooperators contributed over \$2.6 million—a ratio of 1.7 to Challenge Cost-Share funds.

Challenge Cost-Share projects included improving forest habitat for such wildlife as deer, elk, grouse, turkey, and songbirds; developing wetlands; reintroducing peregrine falcons; building nest boxes; closing roads to protect eagle nests and

Rise to the FUTURE



Fish Your National Forests

"Rise to the Future" is a renewed program to manage fish habitat and angling opportunities on national forest waters.

other endangered species; and improving fish habitat.

The Challenge Cost-Share program strengthened partnerships with forest users by improving understanding of overall Forest Service goals and reducing misunderstandings among users.

Examples of Challenge Cost-Share projects include:

- Summer chinook Salmon will have improved spawning and rearing habitat, thanks to the concerned involvement of the Gem State Fly Fishers and Idaho Salmon and Steelhead Unlimited. By volunteering to work on weekends, members halted erosion along 200 feet of Johnson Creek on the Boise National Forest in Idaho. Their cooperative effort with the Forest Service will reduce the amount of sediment that enters the South Fork of the Salmon River.
- In Arizona, the Tonto National Forest continued working with the Zane Gray Chapter of Trout Unlimited, Arizona Flycasters and Desert Flycasters, the Boy Scouts, The Arizona Boy's Ranch, and other groups to complete a massive effort for the restoration of Canyon Creek. This effort involved a multifaceted program of livestock control, riparian fencing, willow and cottonwood plantings, and numerous stream habitat structures built of large logs and boulders. Several hundred volunteers contributed

their labor to the project. Cash and in-kind contributions were valued at more than \$19,000.

Wildlife and Fisheries Habitat Relationships

During 1987, significant progress was made in using the Wildlife and Fisheries Habitat Relationships (WFHR) system. A total of 28 habitat capability models for evaluating wildlife and fish habitat were operational in 1987. The WFHR system has enhanced our ability to measure wildlife and fisheries resources and provided better methods for addressing diversity, viable populations, and production of species in public demand. Use of this system has improved wildlife and fish input

to forest plans, environmental analyses, and projects on the ground.

Other models simplify the monitoring and evaluation of resource interactions. The Musky Lake Reproduction Model, for example, is being used in lake management decisions, including a cost analysis to help determine priorities for project completion.

The Alaska Region is developing cumulative effects models and habitat capability models for fish. The Rocky Mountain Region is using habitat capability models to guide and evaluate resource treatments. The Alaska Region also developed a habitat suitability model to help managers identify key areas of bald eagle breeding habitat and to evaluate existing and potential habitat



Members of the Wisconsin Waterfowlers Association join in partnership with the Nicolet NF to build and install wood-duck nest boxes under the Challenge Cost-Share Program.

condition. This model was presented in a report published by the region in 1987, entitled "The Bald Eagle in Southeast Alaska." The report reviews the status and biology of the bald eagle population in Southeast Alaska and its relationship to management of the Tongass National Forest.

In addition to cumulative effects and population viability analysis, WFHR models make efficient risk assessment for threatened, endangered, or sensitive species, and help evaluate habitat capability and project economics. The models are also being used by our cooperators, such as State fish and wildlife departments, Indian tribes, and others in developing comprehensive wildlife management plans.

Threatened, Endangered, and Sensitive Species Management

Funding for habitat improvement in the threatened, endangered, and sensitive species program was increased from \$2.5 million in 1986 to \$3.5 million in 1987. This increase provided for additional habitat improvement and recovery tasks associated with the national program. An additional \$384,000 of habitat improvement and recovery tasks were accomplished through the Challenge Cost-Share program.

National forests and grasslands are home to 140 plant and animal species listed as threatened or endangered. The Fish and Wildlife Service has approved recovery plans for 80 of these species. These plans are used by the forests to guide recovery activities. An additional 761 species are considered sensitive by the Forest Service and also receive special management considerations.

We are giving national emphasis to the bald eagle, peregrine falcon, grizzly bear, Puerto Rican parrot, red-cockaded woodpecker, and the Mount Graham red squirrel. Other species receiving regional emphasis are the mountain caribou, Kirtland's warbler, Lahontan cutthroat trout, and Gila trout. The Gila trout, Gila topminnow, and Lahontan cutthroat trout are being considered for removal from endangered or threatened status as a result of the cooperative management programs.

The final "Interagency Guidelines for Grizzly Bear Management" was distributed in early 1987. The four

western regions involved with this issue are implementing a long-range management program, entitled "Charting the Course—The Forest Service Grizzly Bear Conservation Program."

Accomplishments in the Sensitive Plant Program included the completion of recovery tasks for several threatened or endangered plants, as well as the update of regional data bases on sensitive plant species. We also prepared a technical report supporting delisting of the threatened plant, *Astragalus perianus*.

RANGE

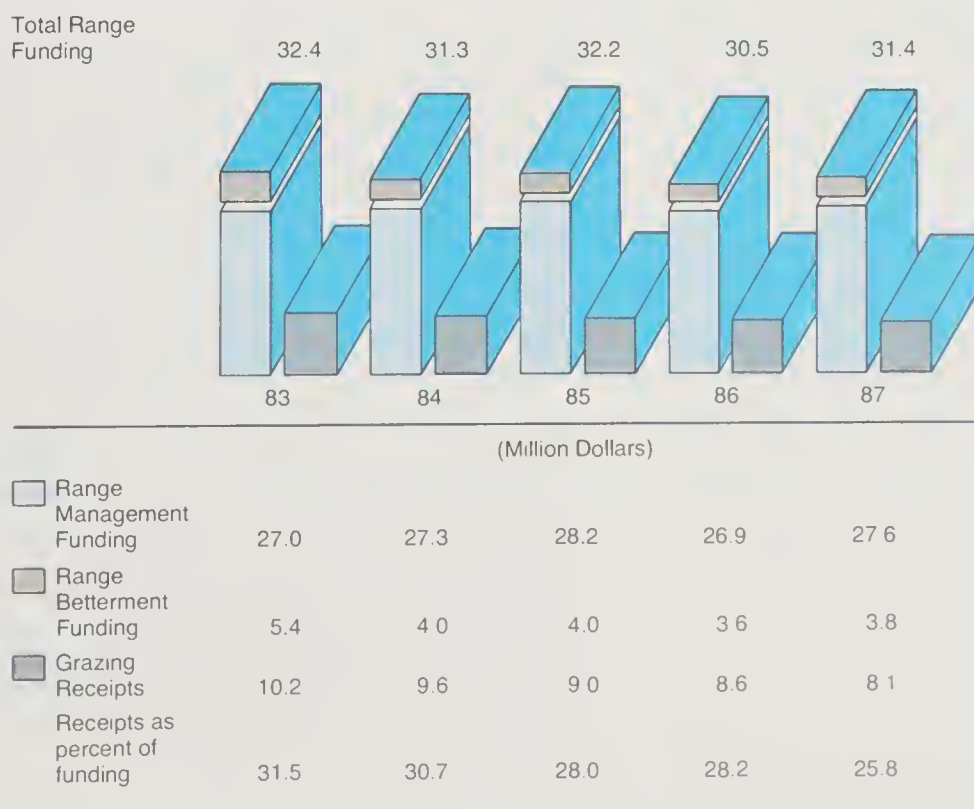
The Forest Service manages range vegetation, in both forested settings and on open rangelands, to meet diverse multiple uses. Range vegetation provides habitat for wildlife and wild, free-roaming horses and burros, as well as forage for these animals and domestic livestock. The type of range vegetation, its quality or condition, and relative abundance also affect water quality and quantity, soil productivity and stability, and aesthetics. In addition to managing for forage production, range conservationists provide their

vegetation management expertise to a wide range of other national forest programs, including timber, wildlife, recreation and watershed.

The range program was funded at \$31.4 million (including Range Betterment funds) in 1987, and returned \$8.1 million to the Treasury from grazing fees. Based on the existing Presidential formula, grazing fees for the national forests in the 16 Western States remained at \$1.35 per animal-unit-month (AUM). (An animal-unit-month is the amount of forage needed to support a 1,000-pound cow or its equivalent for 1 month.) Eleven percent of the total receipts came from grazing on national grasslands and land utilization projects in the Plains States and Eastern National Forest System range. Grazing values from these areas ranged from \$.46 to \$2.74 per AUM in 1987.

A total of nearly 100 million acres (52 percent of all National Forest System lands), in 35 States, are divided into 9,610 range allotments that are managed for forage production. These allotment acres are further classified as suitable or unsuitable for livestock grazing, with about 50 percent classified as suitable.

Range—Funding and Receipts



Report of the Forest Service Fiscal Year 1987

Range Condition

In managing range vegetation, we give first priority to maintaining or improving its productivity and condition. About 79 percent of the 50 million suitable acres in allotments are in satisfactory condition, with soil adequately protected and with forage species composition and production at acceptable levels or on an acceptable trend.

Noxious Weeds

According to current estimates, noxious weeds of various species infest 4.9 million acres of National Forest System lands in the Western States, and they are continuing to spread. Weeds create a management problem that affects many resource values, such as wilderness, soil, aesthetics, and land values, as well as the forage supply and its nutritional value for wild and domestic animals. A viable program of controlling the spread of noxious weeds depends on coordinated efforts by all landowners in an infested area.

In cooperation with local weed control districts, the Forest Service treated 17,811 acres of National Forest System lands in 1987, exceeding the funded target by 22 percent. We were able to treat additional acreage because of the increased availability of cost-effective biological control methods including insects, such as musk thistle weevil or spurge hawkmoth, and pathogens (bacteria). In addition to weed treatments accomplished with appropriated funds, another 3,574 acres were treated using contributed funding and labor.

Livestock Grazing

In 1987, the Forest Service administered 12,489 permits for 9.9 million AUM's of grazing by domestic cattle, horses, sheep, and goats. Permitted AUM's declined slightly from 1986, but continued to exceed the 1985 RPA program level of 0.1 million AUM's. Total permitted AUM's are expected to continue to decline as forest plans are implemented.

Range Improvements

Range improvements are used to improve range condition, wildlife habitat, and soil and water quality,

as well as to protect watersheds and fragile areas while providing for sustained use. We identify needed forage and structural improvements in consultation with range users and other resource interests and design these improvements to protect vegetation and other range resources and gain better distribution of grazing and foraging animals. More than 2,730 structural improvements, such as fences, water developments, and pipelines were constructed with appropriated funds. This fell short of the funded target by 9 percent because the actual costs were higher for the materials involved than those estimated. We completed range forage improvement work, such as prescribed burning, seeding, and mechanical treatments, on 76,829 acres, exceeding the funded target by 29 percent.

In addition to improvements accomplished with appropriated funds, 1,876 high priority structural improvements and 43,400 acres of forage improvement work were accomplished using donated labor, funds, and materials supplied by cooperating permittees, other agencies, and volunteers.

Wild Free-Roaming Horses and Burros

The Forest Service estimates that 1,225 wild horses and 350 wild burros are the appropriate management levels for the 45 wild horse and burro territories on National Forest System land. In 1987, 156 excess wild horses and burros were captured and made available for adoption.

SOIL, WATER, AIR, AND WEATHER

Objectives of the soil, water, air, and weather programs are to provide an adequate supply of high-quality water, to protect and improve soil productivity, to protect air-quality-related values, and to establish a weather information management system.

Soil and Water Resource Improvement

During 1987, we improved the soil and water conditions on a total of 17,433 acres. Total improvements exceeded planned targets because of additional acreage completed by

human resource programs, K-V funded improvements, and favorable unit costs through contracting.

Appropriated funds were used to improve watershed condition on 10,413 acres. This is 155 percent of the funded target, and 144 percent of RPA targets.

Knutson-Vandenberg Act funding from timber harvest receipts is an important component for improving soil and water productivity. K-V funded improvements on 6,043 acres in 1987. Many cost-effective improvements were accomplished on timber sale areas to correct and improve watershed conditions.

Through the Surface Mining Control and Reclamation Act and other State funding sources, 198 acres of abandoned mined lands were restored. Human Resource Programs and volunteers improved watershed condition on another 779 acres of mined areas. Watershed conditions were also improved through selected range, wildlife, and fish habitat improvements.

Soil and Water Inventories

In 1987, the Forest Service completed soil inventories on 10.3 million acres, compared to 5.6 million acres in 1986. This increase occurred in support of the Tongass timber sale program, where added emphasis is placed on protecting soil and water resources. Inventories provide information about soil suitability and productivity, erosion, and stability problems. Most Forest Service soil inventories are conducted as part of the National Cooperative Soil Survey.

Inventories also were completed on 2.8 million acres for water resource data. These inventories provide information needed to improve water yields, to quantify water rights, and to determine conditions in riparian areas. In Montana, 182 water rights cases were settled in the State water court. In Colorado, a detailed survey was completed on 1.5 miles of the North Fork of the South Platte River to analyze the effects of a proposed highway relocation project.

Emergency Rehabilitation

The Forest Service applied emergency rehabilitation measures to 717 acres of flood-damaged watersheds as authorized by the Agri-



Before. Example of a watershed improvement project on the Upper San Francisco River watershed, Apache NF. The treatment included shaping and contouring of channel banks and seeding of all disturbed areas.



After. Benefits provided for improved wildlife habitat and increased forage production.

culture Credit Act of 1978. Such emergency measures are taken to protect lives and property downstream and to reduce further damage to resources. Plans for rehabilitating fire-damaged resources are addressed in the special Fire section of this report.

Air Resources

During 1987, the Forest Service reevaluated operating procedures and policies for managing the air resources on National Forest System lands. As a result, the Agency strengthened its capabilities to manage air-quality values and to meet Clean Air Act requirements. We reviewed 62 new-source permit applications during 1987. The reviews focused on the projected effects of pollutants on air-quality-related values in designated class I areas. The applications included major petrochemicals, gas, and minerals developments. To evaluate resource effects and needs for protection, we are continuing to monitor air-quality-related values, such as visibility and lake chemistry, at 32 sites nationwide.

Weather Program

The weather program incorporates meteorological expertise and data into overall Forest Service management. To meet program objectives, the Forest Service entered into a contract to assess needs and develop a system for gathering, processing, distributing, and storing weather information in a new Weather Information Management System (WIMS).

Resource Coordination

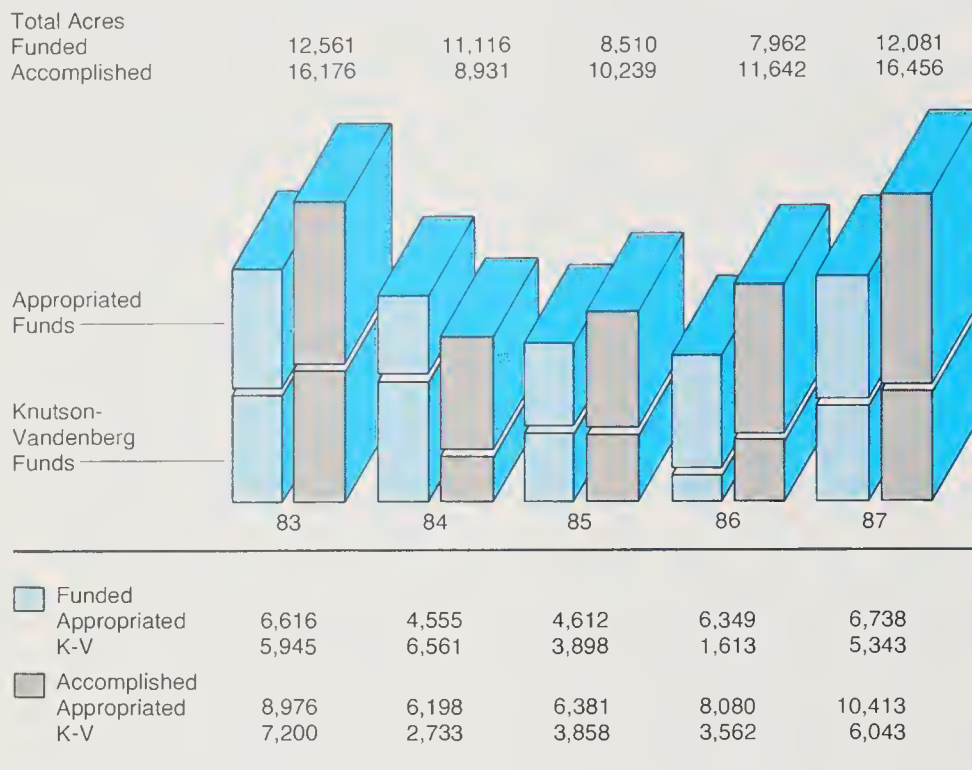
The Forest Service accomplishes most soil, water, and air objectives by incorporating them into implementation of other management programs. This is done by designing conservation practices that avoid resource damage, control nonpoint sources of pollution, and maintain riparian values and air quality. Approximately 40 percent of soil, water, and air funds were spent on such resource coordination.

Monitoring

The Forest Service monitors soil, water, and air resources to deter-

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Watershed Improvements



mine if resource prescriptions known as Best Management Practices are properly designed and implemented, as well as to evaluate their effectiveness in meeting management objectives.

- During 1987, concern about potential pollution of a high-quality trout stream led to monitoring on the Allegheny National Forest. In cooperation with EPA and the Commonwealth of Pennsylvania, the forest monitored an abandoned wood chemical plant site next to the stream to determine levels of phenols and dimethylphenols. Air, soil, and water monitoring results indicated no detectable organic compounds in the surface water. The main hazard was determined to be dermal contact with tar. The site is scheduled for cleanup in 1988.
- Water quality also was monitored at 200 sites in the Pacific Northwest Region. The purpose was to assess the effectiveness of Best Management Practices as applied to timber harvesting. The results indicated that these practices are effective and meet designed standards.
- Sample monitoring on eight national forests in the Pacific Southwest Region showed that practices

chosen to manage ski slopes, off-road-vehicle trails, timber harvesting, and roads were at least 95 percent effective in preventing nonpoint source water pollution when properly applied.

- On the Routt National Forest in Colorado, special erosion control measures were taken to protect water quality in a stream that serves as a municipal water supply. During construction of a ski trail, the stream was monitored for suspended sediment during and after construction. The erosion control measures were effective in preventing soil from entering the stream. Only slight increases were found during construction, with concentrations returning to normal in a short time.

FACILITIES

The decentralized management and wide geographic distribution of our 852 administrative units over 46 States and Puerto Rico require the use of more than 21 million square feet of space in approximately 11,200 buildings and related support facilities.

The Government owns, rather than leases, 78 percent of these facilities. As our mission usually re-

quires long-term tenure in a location, ownership is often more cost effective. Owned facilities are constructed to replace high-cost leased facilities whenever analysis shows that cost savings would result.

Facilities construction and replacement funds are continuing funds; thus, projects may start one fiscal year and be completed in another. During 1987, we completed replacement and major expansion of the McCall Smokejumper Base in Idaho and the Redding Fire Service Center in California. Work was also completed on several offices, warehouses, barracks, work centers, airfields, and water systems. Several projects were started including office replacements, work centers, crew quarters, warehouses, airfields, and water systems.

Maintenance funds provided during 1987 allowed us to continue a modest program of abatement of safety and health problems and other more critical problems. Very little progress was made on the large backlog of maintenance needs.

During 1987 we continued to implement two facilities management initiatives that are reducing costs and improving the effectiveness of these support facilities. One is a major effort in master planning to ensure identification of needed facilities. The facility master plans are providing long-term strategies toward our goal of cost-effective replacement, operation, maintenance, and management of buildings occupied by the Forest Service. In addition to determining space and facilities needed, the process identifies existing facilities to be retained, facilities to be replaced, and surplus facilities to be disposed of. While appropriated funds will be required for most facilities construction, some obsolete sites and facilities may be exchanged for new facilities. Such exchanges will help to reduce maintenance costs and ease demands on constrained construction budgets.

The second initiative involves improved maintenance management designed to stretch our facilities maintenance funding. Through this effort, we will more carefully evaluate and implement maintenance tasks and projects. Conservative estimates indicate the initiative will result in a 10 to 15 percent increase in the productivity of maintenance expenditures.

ROADS

The Forest Development Road System provides the principal access to National Forest System lands in accordance with decisions reached in the land management planning process. The system serves all resource management programs, providing access for fire suppression; removal of energy resources such as oil, gas, coal, and firewood; removal of minerals; harvesting of timber; reforestation and timber stand management; recreation activities including camping, hiking, hunting, boating, fishing, and pleasure drives; and livestock grazing.



▲ Collectors are normally single-lane gravel-surfaced roads that provide all-weather access. They make up only 20 percent of the total system and provide a moderate level of comfort and convenience to the traveler.



◀ The majority of our transportation system consists of local roads—75 percent. They are normally single-lane with dirt or gravel surfaces designed for slow speed traffic and provide limited vehicle access.

Arterials make up a very small part of the Forest Development Road system, approximately 5 percent. They are generally double-lane paved roads that provide for convenient, comfortable, and fast travel.

Each road in the transportation system is constructed, maintained, and operated according to its function and is classified as arterial, collector, or local. Arterial roads provide access for relatively high volumes of traffic to large areas of land. They usually connect with other arterial roads or public highways. Collectors are intermediate links that provide access to major land masses within the forest and link the local roads to the arterials. Local roads provide access for low volumes of traffic from the collector roads to specific land and resource sites.

The Forest Service manages road access within National Forest System lands to provide appropriate, safe, and efficient travel, and to pro-



Report of the Forest Service Fiscal Year 1987

tect the affected resources (such as soil, water, fish, wildlife, timber, recreation, and range). We do this by controlling use on the 344,000 miles of existing roads.

The physical condition to which a road is maintained is one way of limiting its use. During 1987, we maintained 52 percent of the road system for use by high-clearance vehicles (such as pickup trucks, 4-wheel drive vehicles, and logging equipment) and 31 percent for use by modern low-clearance passenger cars. The remaining 17 percent were closed to yearlong traffic.

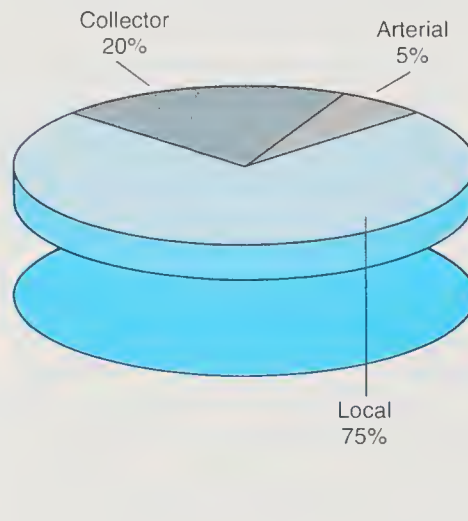
When additional protection for a resource is needed, such as for elk during calving, use is controlled by seasonal restrictions. Restrictions are implemented to protect wildlife during migration, mating, or rearing periods, to prevent fires and provide for public safety during periods of high fire danger, to protect road investments during inclement weather and unstable ground conditions, and

to provide for public safety during periods of heavy commercial use.

During periods of nonuse by normal vehicles, roads are generally

available for other uses, including snowmobiling, off-road vehicles, horseback riding, hiking, and hunting.

Road Function—Percent of Total System



Construction and Reconstruction

During 1987, we constructed or reconstructed a total of 7,876 miles of road and 95 bridges through the three primary funding sources, at a total cost of \$309.5 million, including engineering and program support costs. We also constructed or reconstructed an additional 51.8 miles of road and 42 bridges, through the Tongass Timber Supply fund at a cost of \$20.8 million. The 99th Congress directed each region of the Forest Service to reduce the average unit cost of timber road construction in 1987 to 5 percent below 1985 levels. In response to this direction, actions were taken to reduce the direct costs of engineering and building roads and the indirect costs of administering and sup-

Typical National Forest Road System



porting the road program. The cost-saving measures employed resulted in accomplishing a 9 percent reduction nationally. The average unit cost was reduced from \$45.5 thousand to \$41.4 thousand.

The typical forest road project in 1987 was the construction or reconstruction of a relatively low-standard (single lane, 12 to 14 feet wide, dirt or gravel surfacing) local road to provide access to timber. In the future these roads will be also used for the management and enjoyment of other resources. Most arterial roads are in place and require only limited investments to improve them. The same is generally true for collector roads, except in the few forests with large unroaded areas where some new construction is required to implement decisions made in forest plans.

Forest road funding comes from three sources: the Purchaser Credit Program (PCP), which allows a timber purchaser to build roads and receive credit equal to the value of those roads to be applied toward the purchase of the timber; the Purchaser Election Program (PEP), which allows small purchasers to have the Forest Service build roads funded from timber payments; and the Forest Road Program (FRP), which provides for building roads with appropriated funds.

Of the total 7,876 miles of roads constructed or reconstructed during 1987, 1,973 miles were constructed and 3,509 miles were reconstructed using PCP or PEP funds. The FRP provided for construction of 620 miles and reconstruction of 1,774 miles.

The Forest Service Productivity Improvement Team (PIT) report, published in 1987, identified activities in planning, cost accounting, engineering support services, road construction, road operation, and road maintenance that could enhance efficiency and save costs. Service-wide, we are proceeding to implement the recommendations of this PIT report.

To ensure there is adequate information to manage the road program, we developed and implemented the Road Analysis and Display System (ROADS). ROADS provides tools to analyze and monitor economic efficiency and to control costs associated with the Forest Road Program. The process will also help people outside the Forest Ser-

vice better understand the road program, and it will provide a systematic approach for tracking the progress toward achievement of a cost-efficient road system.

We have reduced road costs as a result of direct management atten-

tion to the issue of road costs.

Through various management initiatives, we have paid particular attention to the major costs in the road program. Because intensive land-use planning revealed that perennial use of many new roads is unnecessary,

SUMMARY OF ROAD CONSTRUCTION/RECONSTRUCTION

FY 1986 Actual Unit Costs (M\$/Mile)

Region	Cost of Engineering and Building Roads (A)	Cost of Administering and Supporting Program (B)	Gross Unit Cost (A + B)
R-1	32.7	8.1	40.8
R-2	31.0	5.0	36.0
R-3	28.1	12.0	40.1
R-4	29.3	10.8	40.1
R-5	45.2	6.3	51.5
R-6	42.9	6.9	49.8
R-8	28.5	3.5	32.0
R-9	26.6	7.4	34.2
R-10	184.7	106.8	291.5
National	36.6	8.9	45.5

FY 1987 Actual Unit Costs (M\$/Mile)

Region	Cost of Engineering and Building Roads (A)	Cost of Administering and Supporting Program (B)	Gross Unit Cost (A + B)
R-1	29.1	5.5	34.6
R-2	22.9	3.7	26.6
R-3	20.1	5.5	25.6
R-4	27.3	8.0	35.3
R-5	43.1	7.7	50.8
R-6	40.6	5.6	46.2
R-8	25.1	3.1	28.2
R-9	24.4	7.1	31.5
R-10	163.9	66.5	230.4
National	33.8	7.6	41.4

Percent of Change

Region	Cost of Engineering and Building Roads (A)	Cost of Administering and Supporting Program (B)	Gross Unit Cost (A + B)
R-1	- 11.0	- 32.1	- 15.2
R-2	- 26.1	- 26.0	- 26.1
R-3	- 28.5	- 54.2	- 33.7
R-4	- 6.8	- 25.9	- 12.0
R-5	- 4.6	+ 22.0	1.4
R-6	- 5.4	- 18.8	- 7.2
R-8	- 11.9	- 11.4	- 11.9
R-9	- 9.0	- 4.1	- 7.9
R-10	- 11.3	- 37.7	- 21.0
National	- 7.7	- 14.6	- 9.0

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the percentage of intermittent-use roads is increasing. Intermittent-use roads are generally designed to lower standards than roads open for continuous use, and thus cost less to construct. In some regions, the roads are seeded to grasses or native vegetation to serve as linear wildlife openings. Improvements in other areas, such as construction and engineering services, also contributed to the cost savings.

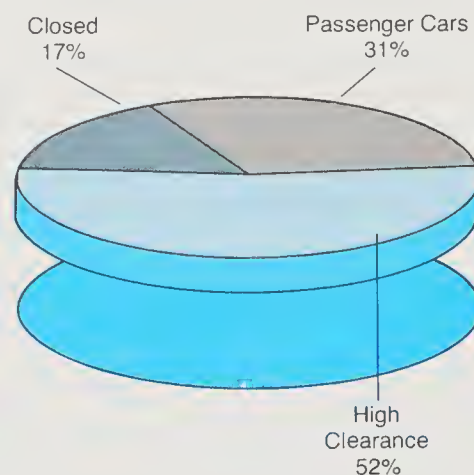
Sometimes, actions taken to manage costs can defer or transfer costs. For example: we can defer costs by requiring less surfacing materials now and more frequent reconstruction later, and we can transfer costs by constructing lower standard roads (with steeper grades, rough running surfaces, etc.) that raise user costs. Care is taken to ensure that roads are designed to serve the projected traffic requirements at the lowest cost for transportation, which includes construction, maintenance, and user costs, consistent with environmental protection and safety considerations.

In 1982 and 1985, audits by the Office of Inspector General indicated a need for the Forest Service to change road survey, design, and construction procedures to meet resource needs at reduced costs. A subsequent audit was done during 1986-87 to determine the adequacy of corrective action, evaluate implementation of new road construction policies, and identify and evaluate internal Forest Service controls. The audit found that the Forest Service has established reasonable internal controls over the road program and has made significant progress in implementing cost-reduction policies and procedures.

Maintenance

During 1987, the Forest Service used \$63.1 million in Federal appropriations to perform needed maintenance work. This work was in support of Forest Service administrative use and non commercial forest users. Commercial forest users, such as timber purchasers, miners, private timber companies, and others, performed road maintenance work related to commercial activities. The commercial users accomplish their road maintenance requirements by actually doing the maintenance work or by depositing funds for the Forest Service to do

Road Management— Percent of Total System



the work. An estimate of overall program distribution in 1987 is:

- Road maintenance with appropriated funds
48 percent (\$61 million)
 - Requirements on federal timber purchasers
48 percent (\$61 million)
 - Requirements on other commercial users
4 percent (\$5 million)
- Total Program \$127 million

The estimated value of the total program, \$127 million, is equivalent to approximately 0.7 percent of the asset value of the roads, which are estimated to exceed \$18 billion. A cost-effective maintenance program for low-volume road systems is between 1 and 2 percent of replacement cost. With 1987 funding, about 60 percent of the Forest Development Road system was maintained to a standard adequate to support existing traffic demands. The remaining 40 percent of the road system was maintained at a lower level, and use was limited either by the physical condition of the roads or by regulatory restriction.

TECHNOLOGY DEVELOPMENT AND APPLICATIONS

As part of engineering support, the Forest Service has a technology development and applications program. This program is akin to the development side of corporate research and development programs. As such, it complements activities carried out by the Forest Service re-

search program. The purpose of this program is to develop or identify promising new technology and to assist in adopting it in all phases of land management. The bulldozer, the mainstay of today's construction industry world-wide, was conceived and developed through this program during the 1930's. Annually, numerous new ideas, methods, systems, materials, information and equipment are brought into use that improve efficiency. The following are some examples.

Substitute Earth Anchors

The Forest Service has developed new anchoring methods for cable logging systems. Large stumps are used as anchors to guy towers and skylines for timber harvest. However, in some areas stumps of adequate size or in the proper location are lacking; thus, the need for better anchoring methods.

Engineers at the San Dimas Technology and Development Center developed two types of tipping plate anchors; one for depths of 10 to 15 feet, the other for 5 to 7 feet. The deep plates have demonstrated capacities of from 50,000 to 200,000 pounds; the shallow ones, from 10,000 to 40,000 pounds depending on the depth of installation and the soil type. The Forest Service is transferring this new technology to the logging industry, thus enabling them to employ environmentally preferred log yarding systems at reduced costs.

Satellite Position Location Systems

Rapid development of satellite-based global positioning systems has progressed to the point where they now provide an economical method of obtaining data about the spacial location of resources.

Missoula Technology and Development Center, in cooperation with the University of Montana, established a test course at Lubrecht Experimental Forest for evaluation of this equipment. These evaluations will help managers select the proper equipment for the jobs to be performed and will aid in the rapid adoption of this new technology.

Reduced Truck Tire Pressures

Recent Department of Defense research and development have pro-

vided systems that allow vehicle operators to vary tire pressures while the vehicle is in motion. Preliminary studies conducted by San Dimas Technology and Development Center engineers indicated that the use of lowered logging truck tire pressures in low-speed applications increased vehicle mobility, reduced vehicle operating costs, reduced driver fatigue, and reduced road construction and maintenance costs. Within the next 6 months, this technology will be put to use in the forest products industry through incentives and requirements in timber sale contracts.

Work Crew Safety

Proper training for work supervisors is important where field crews perform hazardous tasks or work in a hazardous environment. Missoula Technology and Development Center staff prepared a training course for first line crew supervisors. The course draws on the unique work culture of Forest Service crews showing that productive crews are safe crews and that production and safety are interdependent.

Remote Sensing Training and Awareness

During 1987, the Nation-wide Forestry Applications Program conducted a program to develop and maintain aerial photographic interpretation skills for resource technicians and professionals. The program is designed to train 300 to 400 employees each year.

Also in 1987, the Bighorn National Forest in the Rocky Mountain Region adopted a significant new approach to mapping and classifying riparian management areas using high-altitude infrared color aerial photography acquired from NASA's Ames Research Center. Current development, in cooperation with the Rocky Mountain Region's range and wildlife staff and the forest, is focused on monitoring riparian management areas to assess the effects of management prescriptions under the Forest Land and Resource Management Plan. Similar applications of remote sensing technology are being used to improve forest plantation stocking and survival surveys, map gypsy moth defoliation in the Northeastern U.S., assess the effect of hardwood decline in the

South, provide important data for planning resource recovery after major fires, and many others.

PROPOSED FOREST SERVICE BUREAU OF LAND MANAGEMENT INTERCHANGE

The Forest Service and Bureau of Land Management each administer about half of the 346 million acres of Federally-owned multiple-use lands in the contiguous 48 States. Some National Forest System land and much of the public land lies in scattered parcels intermingled with other ownerships. These land patterns are accidents of history, products of compromise, or the result of separate land actions dating back to the 1800's. The lands are often very similar in character and share the same users, management problems, and resource values. The mixed ownership pattern leads to considerable duplication of effort in administration, many other inefficiencies, and confusion among users of the Federal lands who must deal with either Agency.

This duplication of both effort and work force decreases the effectiveness of the management and use of the resources. Through exchange of administrative responsibility, there is a great opportunity to eliminate much of the inefficiency at considerable long-term cost savings to the Federal Government, as well as to resolve some of the longstanding boundary problems. The three goals of the proposed interchange are to enhance public service, to improve efficiency in managing natural resources, and to reduce Agency costs. The proposal is the result of a cooperative effort by the Bureau of Land Management and the Forest Service to develop a unified approach to implement the initiative.

Following the initial announcement of the concept in January 1985, field offices of the two agencies worked with the public to refine the concept and define specific details. This intensive public participation effort included discussions with congressional delegations, Governors, individuals, and hundreds of public groups, as well as a formal public comment period with 30 public hearings. All comments were reviewed, analyzed, and used to further refine the proposal.

The proposal involves the transfer of 25 million surface acres, of

which approximately 15 million acres would move from Bureau of Land Management to Forest Service and 10 million acres from Forest Service to Bureau of Land Management. A key feature of the proposal in improving management efficiency is having both the surface and subsurface resources managed by the same agency. We estimate one-time implementation costs of about \$23 million over a period of 3 to 5 years. The two agencies would be able to reduce staffing by about 350 positions. Of 71 towns now having offices for both agencies, 35 would have only one office following the interchange. In addition, mineral lease records for Eastern States would be moved to Forest Service regional offices in Atlanta and Milwaukee. There would be an estimated \$13 million to \$15 million annual savings once the interchange is fully implemented. Service to the public would be enhanced, particularly through the convenience of having to work with only one agency in a given locality where they now must work with two.

The interchange proposal was submitted to the 99th Congress in February 1986. The bill was introduced, but no action was taken. The draft language of the proposal was revised for the 1987 program only for clarity and to update references to the current year.

The Departments of Agriculture and Interior transmitted the proposal to the 100th Congress in April 1987. It was introduced to both Houses, but no action was taken.

State and Private Forestry



INTRODUCTION

State and Private Forestry provides leadership and assistance for management of private nonindustrial forest lands in the United States. These lands include 58 percent of the Nation's commercial timberlands, and approximately 45 percent of them offer economic opportunities for intensified timber management. If they had this intensified management, these lands could produce more than twice the volume of timber than they produce today. In addition, water yields from these lands could be increased, water quality could be improved, and damages from erosion, floods, pests, and fire could be reduced.

We work cooperatively with State forestry organizations to provide land management assistance to the owners of these nonindustrial private forest lands. We also coordinate with the many agencies and organizations whose programs affect private forest lands in this country.

We provide leadership in protection from forest pests and wildfires on both Federal and non-Federal lands. Boundaries between land ownerships do not limit the activity of pests or fires, so protection programs cannot be boundary-conscious. In forest pest management, State and Private Forestry performs prevention and suppression activities directly on all Federal lands, and provides assistance for those activities on State and private lands.

We also lead a well-coordinated fire protection network, which involves many government and private organizations that can be mobilized quickly to combat wildfires on National Forest System, State, or private lands.

State and Private Forestry has the lead responsibility for transferring new and existing knowledge, information, and capabilities both inside and outside the Forest Service for the purpose of improving forest resource management, utilization, and protection. As a result of the Technology Transfer Act of 1986, the Forest Service is examining and emphasizing its technology transfer policies. A proactive agenda is being developed that recognizes the need to transfer and share technology with other organizations (States, universities, industry, etc.).

This chapter discusses the State and Private Forestry programs in the following five areas:

- Forest management and utilization

- Forest pest management

- Fire and aviation management

- Special projects

- Transferred programs

Programs in the first four categories are funded directly by Congressional appropriations. The Soil Conservation Service and other Federal agencies provide funds from their appropriations for the transferred programs. Targets, listed in table 43, are accomplished with a combination of State and Federal funds.

FOREST MANAGEMENT AND UTILIZATION

In the United States, demand for forest products has been projected to double by 2030. To meet this demand, it is critical that productivity of private, nonindustrial forest lands, which comprise 58 percent of the Nation's commercial forest land, be increased. The objective of the programs described in this section is to assist in meeting this need.

Forest Management

We provide technical and financial assistance to State forestry organizations, which in turn provide technical advice to private forest landowners for managing the forest resources and improving the productivity of nonindustrial private forest lands. State foresters, in coop-



Forest management funding supports State forestry agencies technically and financially, who in turn provide technical assistance to private landowners.

eration with the Forest Service, assisted private owners with the development of forest management plans for 4.3 million acres of nonindustrial private forest land in 1987. Reforestation was accomplished on 1,098,946 acres, 240,180 acres received timber-stand improvement treatments, and 158,353 landowners received professional forestry technical assistance.

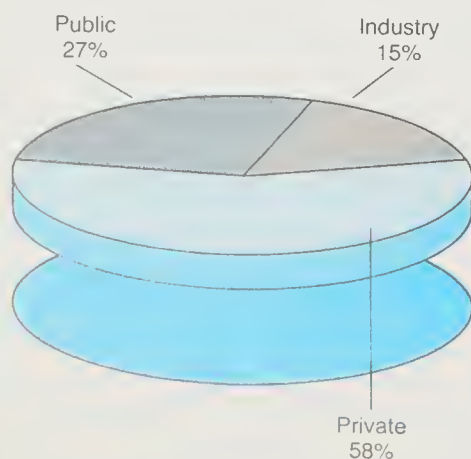
Utilization and Marketing

In response to a congressional request, considerable time and effort were devoted to preparing the National Marketing Initiative Plan during the first quarter of 1987. The Forest Service completed and submitted the plan to Congress February 19, 1987.

No funds were appropriated for the Marketing Initiative in 1987. We continued to work intensively, but on a limited basis, with State foresters and other agencies to increase the export of forest products and to promote development of those depressed rural areas where there is potential for increasing employment in the forest-products industry.

Efforts to introduce new timber bridge technology for use on rural and secondary road systems also continued. This technology makes it possible for treatable low-grade hardwoods to be used for bridge construction, thus facilitating the use of some local species to solve local

**Ownership
Commercial Forest Land**



transportation problems in many Eastern and Midwestern States. Through the cooperative efforts of several State and Federal agencies, two very successful conferences on timber bridges were held in Pennsylvania and Colorado. Discussion included the installation of two bridges to demonstrate the new technology. Two more timber bridge conferences will be held in 1988 in Wisconsin and West Virginia. The USDA's Office of Transportation and the Federal Highway Administration in the Department of Transportation have been very helpful in these efforts.

State and Private Forestry continues to place a high priority on introducing new technologies that make better use of under-utilized species and small, poor-quality logs of high-value species. These efforts help create jobs in local communities, improve the composition and quality of the residual forest for future generations, and make intensive management of the forest resource more attractive for the landowner. In 1987, new microcomputer programs monitored current practices and indicated possible opportunities for improving timber harvesting, wood processing, and use. In addition, the Forest Service sponsored training workshops and conferences to improve market development. Although these programs are modest in scope, they have resulted in several major projects that are aimed at improving the competitiveness of the U.S. timber industry and at bringing together wood and wood-products buyers and sellers.

Another emphasis in 1987 was the continued development of new harvesting programs that seek to increase logging efficiency and reduce wood waste on the national forests. Initial tests of a new computer program to improve felling and bucking techniques were very successful, and it will now be expanded to include graphic capabilities to improve its use. Such programs tie in with efforts to better use our forest resources and to reduce the cost of removing logging residue prior to replanting or seeding cutover land.

Rural Development

In 1987, the Administration and Congress asked the Forest Service to increase its efforts in rural development. The USDA thereupon devel-

oped a six-point Rural Regeneration Initiative, including the proposal for establishing rural enterprise teams using the USDA State Food and Agriculture Councils as primary forums for interagency cooperation in each State and for feedback on rural development accomplishments and concerns.

State and Private Forestry had the lead role in coordinating Forest Service participation in USDA's seven regional rural development workshops. Forest Service State Food and Agriculture Council (SFAC) representatives attended SFAC rural development meetings, were involved in State Rural Enterprise Team activities, and made inputs to rural development plans.

State and Private Forestry funding accomplished the following rural development-related activities:

- An economic feasibility study was conducted for the construction of a plant to process low-quality hardwood logs in Vermont.
- A firewood market was developed for local loggers in Colorado.
- A hardwood resource, use, and marketing study was conducted in California.
- A forestry demonstration plot was established to show various techniques for proper forest management in Oklahoma.

All national forests and grasslands are located in rural areas. They provide employment and many other benefits to rural areas and residents including timber harvesting for wood products and fuel, grazing, fishing, hunting, hiking, skiing, and human resource services.

Seedlings, Nursery, and Tree Improvement

Tree planting on nonindustrial forest lands continues to result in record-breaking reforestation. For example, tree-seedling production in 1987 broke the 2 billion mark for the first time in history. Approximately 87 percent of 1987's tree planting occurred on private lands, primarily in the South. The Conservation Reserve Program, established as part of the Food Security Act of 1985 (see discussion under "Forestry Incentives"), will continue to increase tree-planting efforts. State forestry agencies in the South estimated that 734 million seedlings were available for planting in 1987-

88, and 784 million will be available in 1988-89. At 600 trees per acre, these rates could result in more than 1 million acres of forest land planted annually in the South.

The nursery and tree-improvement program provides technical and financial assistance to States for upgrading the quality of seedlings in their nurseries. This assistance is aimed at long-term investments and activities that protect soil and water resources and lead to more productive and economical reforestation of non-Federal lands.



Technical and financial assistance in tree improvement produces seedlings that survive and grow better than nursery-run seedlings on almost all sites. Here, a seed germination test is being conducted at the California Department of Forestry Nursery.

Urban and Community Forestry Assistance

The Urban and Community Forestry program promotes and improves the quality of life in communities through the planting and management of trees, shrubs, and other vegetation. These efforts improve the environment and make major contributions to soil, water, and air quality.

Technical assistance for urban forestry to communities is provided

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through a partnership with State forestry agencies and professional organizations, such as the American Forestry Association, the National Urban Forestry Council, the National Association of State Foresters, the National Arbor Day Foundation, and the International Society of Arboriculture. Target audiences include city planners, developers, builders, city arborists, citizens groups, tree care companies, consultants, homeowners, and the general public. In 1987, financial assistance distributed to the States was approximately \$1.3 million for Urban and Community Forestry activities. State foresters used these funds to provide technical assistance to more than 6,000 projects in communities whose populations totalled about 30 million people. Joint Federal and State program accomplishments in 1987 included the following:

- The National Arbor Day Foundation and the Forest Service presented "Tree City USA" awards to approximately 900 communities for their commitment to tree planting and maintenance. The two most significant awards were presented to the District of Columbia, which qualified for the first time, and Andover, South Dakota, the smallest community (99 citizens) to ever win the award.
- In December 1986, the Forest Service, the American Forestry Association, the National Urban Forest Council, and the Florida Division of Forestry cosponsored the third National Urban Forestry Conference in Orlando, Florida. More than 600 participants attended the technical sessions, which provided information on urban and community forestry for urban forestry practitioners.
- The Forest Service and the State of Illinois initiated an open lands project, "Neighborhood Woods," in Cook County. The program, with volunteers, trains citizen foresters and provides public education to promote tree planting and maintenance in the Chicago area. Congressman Sidney Yates received the Open Land award from the State of Illinois and the National Association of State Foresters for his support of the project and of the Urban and Community Forestry program.
- A partnership between the Forest Service and the States of Washington, Oregon, and California resulted in the publication of "A Guide to Community and Urban Forestry in Washington, Oregon and California." This guide provides information on the process of administering an urban forestry program for communities on the West Coast.
- With Forest Service assistance, the American Forestry Association continued to publish "how to" articles in the American Forest Magazine and the Forum Newsletter, through the National Urban Forestry Council. Circulation for the two publications is 40,000.
- With assistance from the Forest Service, the National Association of State Foresters developed an urban forestry assessment to determine the state of the Nation's urban forests.
- The Forest Service and the Appraisal, Consulting, Research and Training Company have developed a pilot project to train unemployed young adults for entry-level tree-care and landscaping positions. This program will be conducted at the Flatwoods Job Corps Center in Virginia.

State-wide Forest Resources Planning

The State-wide Forest Resource Planning program assists States in State planning for forest resources development by providing technical and financial assistance. Forty-five States are implementing existing plans, and approximately ten are updating their plans based on new forest survey data and socioeconomic factors.

The program has played a major role in the comprehensive planning under way in Idaho and Oregon. These States are addressing all forest landownerships as they relate to the achievement of State goals and timber production.

The following State accomplishments illustrate the kinds of results achieved in 1987 through the state-wide forest resource planning program:

- The Upper Great Lakes Governors' Conference on Forestry, which included the States of Wisconsin, Michigan, and Minnesota, formed

a coalition, the Lake States Alliance, to coordinate and facilitate forest industrial development.

- Louisiana held a Governor's Conference in 1987 to identify the potential of strengthening the economy through forest products and marketing strategies.
- The States of Maine, New Hampshire, New York, and Vermont established the Northeast Forest Alliance for capitalizing on significant forest opportunities of mutual interest or benefit. Alliance activities in 1987 defined an overall marketing strategy for the Alliance area. An analysis of forest conditions in the four-State region and employment and economic data will provide information for economic development agencies and potential industrial users.
- Illinois, Vermont, Wisconsin, and Michigan developed and distributed publications to increase public awareness of forestry as an economic base in their States (target audiences were taxpayers and elected officials).
- Florida held four regional planning conferences that will become the basis of forest resource management in that State.



Harvested forest lands often need to be replanted to provide the next crop of income-producing timber.

State-wide forest resource planning has played an important role in helping diversify rural economies. The IMPLAN computer model, which characterizes the interdependence among producing and consuming sectors of an economy, is being tested for use in constructing State or local economic profiles. The model will provide local communities with estimates of the income and employment that would result from implementing alternative strategies for expanding existing forest-product industries or enticing new industry into the project area.

Bicentennial of the U.S. Constitution

The Forest Service celebrated the Bicentennial with active involvement in both the Federal Inter-agency Task Force and the Private Programs Division for the President's Commission on the Bicentennial. Beginning September 17, 1986 (one year before the Bicentennial), Forest Service efforts resulted in a national "Plant a Living Legacy" kickoff ceremony at Constitution Gardens, Washington, D.C. On that day, Chief Peterson joined Lady Bird Johnson, Chief Justice Warren Burger, Assistant Secretary of Agriculture George Dunlop, and others in a public ceremony to plant the first "Living Legacy" to the U.S. Constitution. Since then, the National Bicentennial Commission officially recognized our "Constitution Trees" project to be one of exceptional merit with national significance.

"Constitution Trees" have now been planted at Forest Service offices and on national forest, State, and private lands throughout the United States. Many organizations have dedicated 1987 planting programs to the Bicentennial. Others have designated 200-year-old trees or groves of 200-year-old trees as Constitution Trees. There are numerous other examples of Forest Service participation and cooperation with State forestry agencies, schools, universities, cities, and towns.

Taxation Program

During 1987, the Forest Service mounted a major effort to inform timber owners about how the 1986 Tax Reform Act affects them.



Bicentennial Celebration at the Forestry Sciences Laboratory in Durham, NH.

Among the many changes in the tax code are loss of capital gains rates and passive loss provisions that limit the deductibility of certain expenses for some taxpayers. Forest Service tax coordinators wrote several articles and publications and held numerous tax meetings, especially in the Northeast and the Southern Region. In addition, a contract has been let to update and revise "A Guide to Federal Income Tax for Timber Owners."

FOREST PEST MANAGEMENT

Healthy, productive forests are essential to the prosperity of the Nation and well-being of its citizens. Insects and diseases kill trees, reduce tree growth, and deteriorate wood quality. The loss of trees adversely affects people, watersheds, wildlife habitat, and recreational values.

The Forest Pest Management program assists land managers in protecting forest resources from insects and diseases on all forested lands—Federal, State and private. The program provides for surveys and technical assistance, suppression, and special projects for technology transfer.

Nationwide, program expenditures totalled \$40 million; \$28 mil-

lion appropriated funds and \$12 million cooperative funds. Cooperative funds supported 75 percent of program activities and 56 percent of suppression activities on State and private lands. Appropriated funds supported the balance of the cooperative activities and all program and suppression activities on Federal lands.

Surveys and Technical Assistance

The Forest Service conducted surveys to detect and evaluate pest populations or vegetation damage on 96 million acres of National Forest System lands and 25 million acres of other Federal lands. State forestry organizations conducted similar surveys on 519 million acres of State and private lands under the Cooperative Forest Pest Action Program. The affected land managers were provided the results of the surveys, along with advice and recommendations, where needed, about suppression alternatives.

Forest Service pest management specialists provided technical assistance to national forest and other Federal land managers and to State pest management specialists through consultation, seminars, and workshops. Assistance topics ranged from pest identification and survey techniques to pesticide selection and

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application. The State pest management specialists provided similar services to State and private land managers.

Prevention and Suppression

Gypsy moths, southern pine beetles, western spruce budworms, dwarf mistletoes, and mountain pine beetles were the targets of major pest-suppression projects. Treated areas consisted of approximately 305,200 acres of National Forest System lands, 18,000 acres of other Federal lands, and 716,000 acres of State and private lands. The projects protected an estimated 1,375 million cubic feet of merchantable timber. Projects also salvaged an estimated 27 million cubic feet of infested timber, resulting in approximately \$121 million in direct benefits. They also helped protect recreation, wildlife habitats, watersheds, and recreational resources.

Gypsy moth suppression projects were conducted on 29,700 acres in two national forests (Allegheny and George Washington), on 14,700 acres in 10 other Federal units in 6 states, and on 648,900 acres of State and private lands in seven States. In addition, the Forest Service contributed to eradication projects on 5,100 acres of National Forest System lands and 3,700 acres of State and private lands in North Carolina and on 12,000 acres of State and private lands in Oregon. Of the 714,100 acres treated, 45.7 percent was with *Bacillus thuringiensis* (B.t.), a bacterial insecticide; 53.8 percent with Dimilin, an insect growth regulator; and 0.5 percent with Sevin, a chemical insecticide. Gypsy moths defoliate and kill trees, reducing timber, recreation, aesthetic, and property values.

In 1987, southern pine beetle suppression was conducted on approximately 108,500 acres in 7 States to protect about 74 million cubic feet of merchantable timber and salvaging an additional 19 million cubic feet of timber. Southern pine beetles kill trees in groups, so treatment involves cutting the infested trees and a buffer strip of unattacked trees to prevent the infestation from enlarging.

Western spruce budworm suppression was successful in the Rimrock Lake area of the Wenatchee National Forest in Washington State. Applying B.t. to 44,000

acres of forest reduced the larval population to a low level and prevented foliage consumption. Warm weather accelerated tree growth and budworm development on the Malheur National Forest in Oregon, cutting short the planned spruce budworm project. About 95,000 acres of forest were treated with B.t.—only half the planned acreage. Another project is anticipated for 1988. A western spruce budworm-suppression project on the Carson National Forest in New Mexico successfully treated about 13,400 acres of forest with B.t. Western spruce budworms feed primarily on the new growth of Douglas-fir, true fir, and spruce trees. Defoliation reduces growth, and repeated defoliation kills tree-tops as well as entire trees.

Conifer trees infected with dwarf mistletoe were treated with silvicultural methods on 10,600 acres of Federal lands. The removal of 6 million cubic feet of infected trees protected another 14 million cubic feet of wood. Dwarf mistletoe infections retard growth, reduce wood quality, and kill trees.

Mountain pine beetle suppression projects covered 8,500 acres of National Forest System lands and 40,000 acres of State and private lands to protect 10 million cubic feet of timber. An additional 2 million cubic feet of timber were removed to reduce the damage. Mountain pine beetles kill high-value trees in recreation and timber-producing areas.

Pest Management Special Projects

Special projects were conducted to acquire pest-impact information, improve existing technology, and transfer new technology:

- The Cooperative Maryland Gypsy Moth Integrated Pest Management Project, completed in 1987, provided an effective survey system to delineate moth populations and demonstrated a correlation between the number of male moths trapped and the presence of egg masses. The project also established that B.t. is more effective than the gypsy moth virus against low-level gypsy moth populations.



In 1987, gypsy moths caused defoliation and damage to trees in 13 Eastern States.

We and our cooperators are applying these results to new projects and ongoing efforts.

- State cooperators and the Forest Service surveyed 410,000 acres of spruce and fir forests in New Hampshire, Vermont, New York, and West Virginia for signs of tree decline. We gathered information about locations of declining trees and descriptions of symptoms that are not associated with known causal agents. The information is being used by the Spruce-fir Research Cooperative to design cause-effect and dose-response studies to determine if atmospheric pollution may be contributing to these symptoms.
- The Forest Service continued its participation in the National Agricultural Pesticide Impact Assessment Program. In 1987, there were 15 projects designed to improve our knowledge of benefits and risks of using pesticides in agriculture, including forestry.
- We trained 370 Federal employees in the proper handling, application, storage, and disposal of pesticides.

Pesticide Use

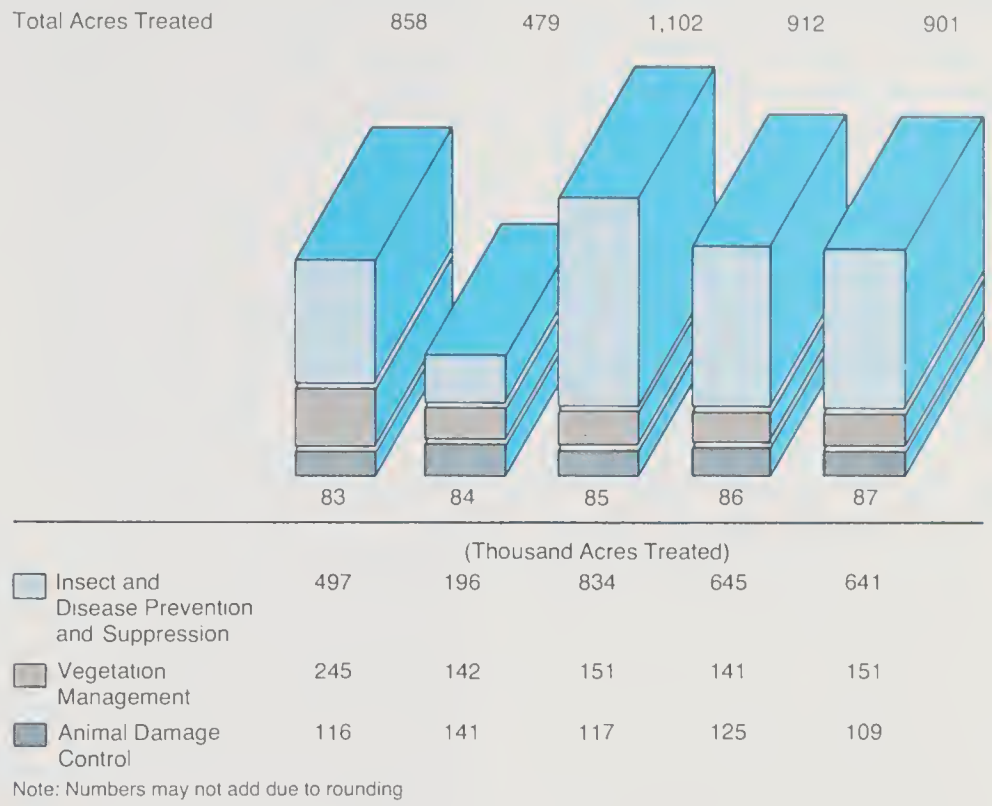
In 1987, we treated about 901,250 acres of National Forest System lands with pesticides, including 641,354 acres for insect and disease prevention and suppression, 151,144 acres for vegetation management, and 108,752 acres for animal control and other minor uses (table 44). Pesticides were applied on less than 1 percent of the total acreage of the national forests and grasslands.

Pesticides are one component of an integrated approach to pest management. They are used to prevent and suppress insect and disease outbreaks, reduce unwanted vegetation, and control animals that cause damage. Pesticides are prescribed only after thorough environmental analyses to determine that their use is appropriate. The Forest Service only uses pesticides registered by the Environmental Protection Agency.

FIRE AND AVIATION MANAGEMENT

The Fire and Aviation Management mission is to provide fire protection on the 191 million acres of

Pesticide Use on National Forest System Lands



National Forest System land and to provide technical and financial assistance on 877 million acres of State-protected lands. While the ownership of the protected lands differ, the overall objectives are the same—prevent or minimize losses from wildfire.

Fire protection is a complex program made up of many elements which are all equally important. These elements are: suppression, presuppression, fuels management, fire prevention, aviation management, Federal excess property, and rural fire prevention and control.

1987 Fire Season

The 1987 fire season, particularly the "Fires of September," was the most destructive for National Forest System lands since 1929, in terms of both acres burned and resource values lost. The events of the 1987 fire season graphically illustrate the need for effective fire protection. Working together with State, local, and other Federal fire protection agencies, Forest Service forces not only provided a high degree of professional firefighting ability, but provided this service at the lowest possible cost.

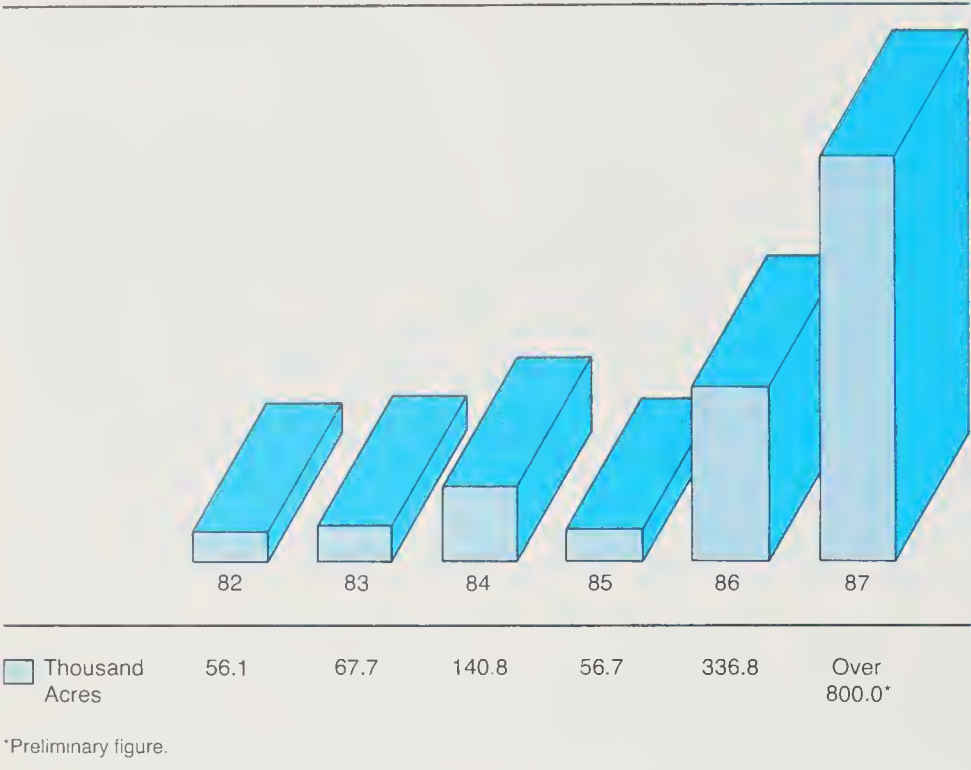
Because fire activity was below that normally expected until late August, only \$45 million had been spent Nationally on suppression at that point. By the end of September, more than 2,000 fires had burned 850,000 acres at a cost of over \$260 million. More than 800,000 of the acres burned were on National Forest System land. This can be compared to the 1985 and 1986 fire seasons, which burned 568,279 and 353,128 acres, respectively.

"Fires of September." Rainfall in Northern California and Southwestern Oregon was below normal levels in the summer of 1987 by more than 25 percent. The low rainfall created extremely dangerous burning conditions. Typically, one fire is started for every 100 lightning strikes; in late August and early September, 11,345 lightning strikes started approximately 1,900 fires, a six to one ratio. Many fires exceeded 1,000 acres, with several in excess of 50,000 acres.

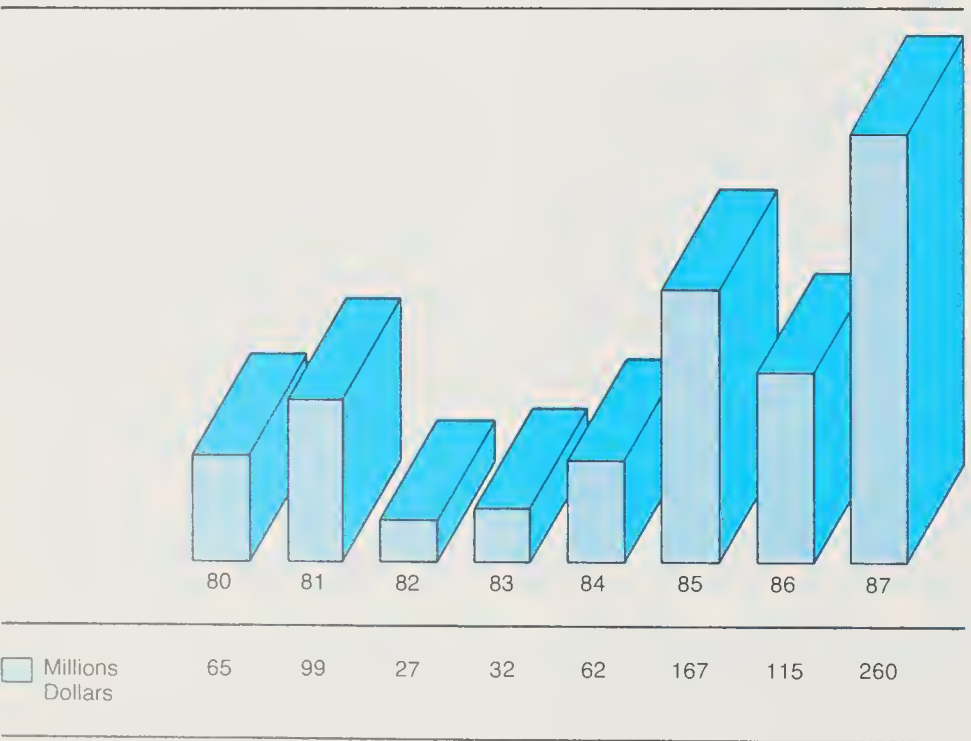
Resource losses from these fires were enormous. An estimated 2.7 billion board feet of timber was destroyed, valued at \$400 million. Damage to many tree plantations and immature timber stands will po-

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Acres Burned Under National Forest System Protection



Suppression Costs



tentially reduce short-term timber yields and productivity. In addition, loss of wildlife habitat, range forage, visual resources, and cultural resources will be difficult to calculate. For decades, we will experience potential future losses from landslides

and siltation of streams and water supplies. During September, 38 homes and 36 structures burned down. Over the entire year, 339 structures (homes, barns, and storage buildings), valued at \$100 million, were damaged or completely

destroyed, and 15,000 people had to be evacuated.

More tragically, 12 firefighters lost their lives in the effort to combat and suppress wildfires in 1987. In recognition of the firefighters who have died in the line of duty each year, Congress proclaimed the "National Fallen Firefighters Memorial" at the National Fire Academy in Emmittsburg, Maryland, as the official National memorial to volunteer and career firefighters.

The extremely high level of fire activity exceeded the combined capabilities of Federal, State, and local fire suppression forces. In some instances, we moved suppression forces away from protecting National Forest System land and resources to provide essential protection to life and developed property.

The intense and individual efforts of many thousands of firefighters prevented a bad situation, the "Fires of September", from becoming worse. Suppression efforts in Northern California alone saved over 5,000 homes and many thousands of acres of National Forest System land and resources and prevented \$800 million in structural losses and damages.

At the end of 1987, many new fire starts continued to plague Southern California, and numerous arson fires in the South and Southeast had blackened thousands of acres. The efforts and cooperation among Federal agencies, State co-operators, rural fire departments, the National Guard, the Air National Guard, individual volunteers, loggers, ranchers, and many others during the "Fires of September" are a major accomplishment in the protection of the Nation's forests. The 1987 fire season clearly demonstrates the need for coordinated and effective fire protection.

Rehabilitation efforts began as soon as the fires were controlled. Initial emergency rehabilitation cost estimates are \$6.1 million. The scope of the emergency watershed rehabilitation activities, although preliminary, are as follows:

- Grass seeding 116,000 acres
- Contour tree felling 4,200 acres
- Stream channel clearing 105 miles
- Structures 2,000
- Road drainage 1,700 miles
- Culvert installations 400

Grass seeding, construction of erosion control structures, and mon-



Between August and September, over 11,000 lightning strikes started approximately 1,900 fires.

Fuels Management

Fuels management plays a critical role in fire protection. Fuels accumulate through both management activities (activity fuels) and through natural processes (natural fuels). There were no intensive fuels management activities on many of the acres burned by the "Fires of September." More than 50 years of natural fuels accumulations and dense, unmanaged forested stands of timber resulted in extreme fuel-hazard conditions. These high-fuel loadings and extremely dry weather caused high rates of spread, high-fire intensities, and dangerous fire behavior too great for direct attack measures. In contrast, direct attack was possible and successful in areas that had received intensive fuels management treatment.

During 1987, the Forest Service performed fuels treatment on 345,162 acres. Fuel treatment is essential to long-term fire protection of National Forest System lands and for adjoining State and private lands and property. Effective fuels management requires a sustained program over many years to achieve program benefits—fewer large fires, fires that are easier to control or manage, and fires that cause less environmental and social damage.

Fire Prevention

The fire prevention program develops and maintains public awareness of the destructiveness of wild-fires and of the need for continuing care with fire-starting agents in the rural and wildland environment. The Forest Service targets specific

itoring must be done to stabilize the soil and protect such downstream uses as domestic water supplies, fisheries, and agriculture. The total restoration and resource recovery effort will take many years to complete, at a long-term cost exceeding \$200 million. The effects of the 1987 fire season will be with us for decades.

Suppression

During periods of high activity and large fires on Federal, State, or private lands, the National Inter-agency Fire Coordination Center (NIFCC) at Boise, Idaho, serves as an interagency dispatch center. From NIFCC, dispatchers mobilize and direct personnel, equipment, and aircraft to the fire.

For a third straight year, a record mobilization of suppression resources was needed during fire season. More than 25,000 people were involved during the peak of activity. During the "Fires of September," NIFCC coordinated and facilitated an unprecedented number of fire-fighting resources. No other civilian organization has the capability to safely and effectively execute such a mobilization.

Presuppression

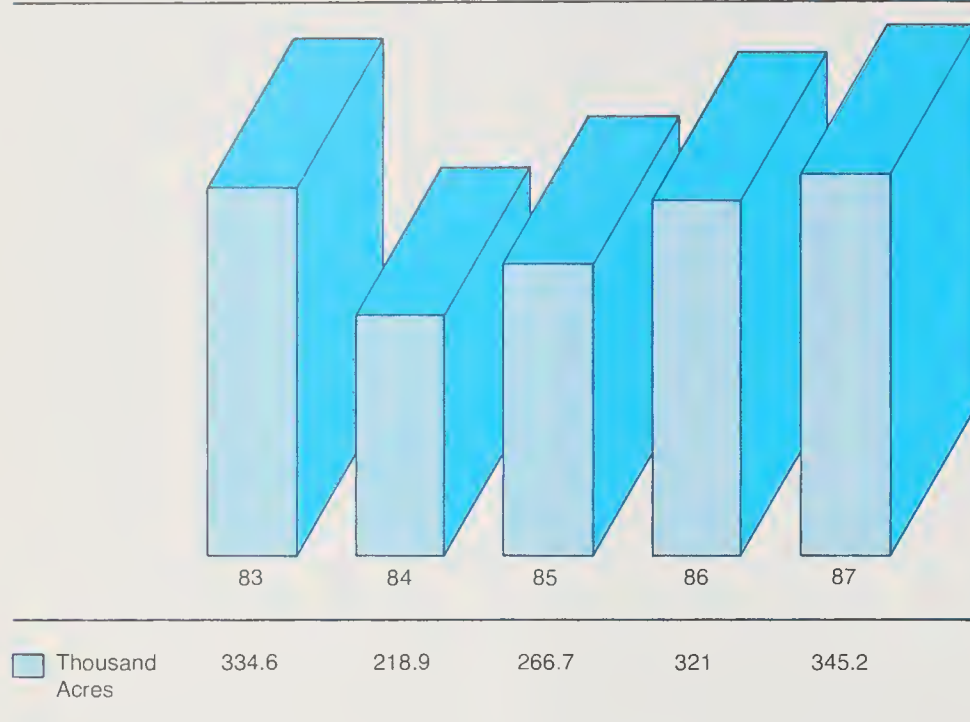
Presuppression includes all preparatory work in anticipation of fire and initial attack on fires. Training, equipping, organizing inter-Regional hotshot crews, contract negotiations for mobile kitchens, airtankers, and supplies are just some of the tasks to perform before fire season. Without a high degree of preparedness, fire suppression activities would be chaotic and unsafe to the firefighters and the public.



Air National Guard MAFFS (Mobile Airborne Firefighting System) in action over North Carolina.

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Acres of Fuels Treatment Accomplished—National Forest System Lands



prevention efforts at causes that have the potential to start fires and could result in major damages, high costs for suppression, and threats to life and property.

Fire prevention accomplishments in 1987 include the "Smokey and the Pro's" program. All 26 major league baseball teams, including the two Canadian teams, held a "Smokey Bear Day" event as part of their public service contribution. An estimated 150 million people received the "Smokey" and fire prevention message. The connection of two American symbols, baseball and Smokey Bear, provided an impressive, low-cost delivery opportunity for fire prevention.

As part of the Smokey Bear prevention program, Junior Forest Ranger kits and teacher kits reached approximately 65,000 children in 1987. These kits present the fire prevention message in an easily understandable way that is readily acceptable by school-aged children. Smokey Bear continues to be one of the most recognizable symbols in the United States and in many foreign countries. The fire prevention message Smokey brings has helped to educate generations of children, reducing the potential for person-caused fires. The cost of suppression on one large fire alone significantly exceeds the entire prevention program costs.

National Wildland/Urban Fire Protection Initiative

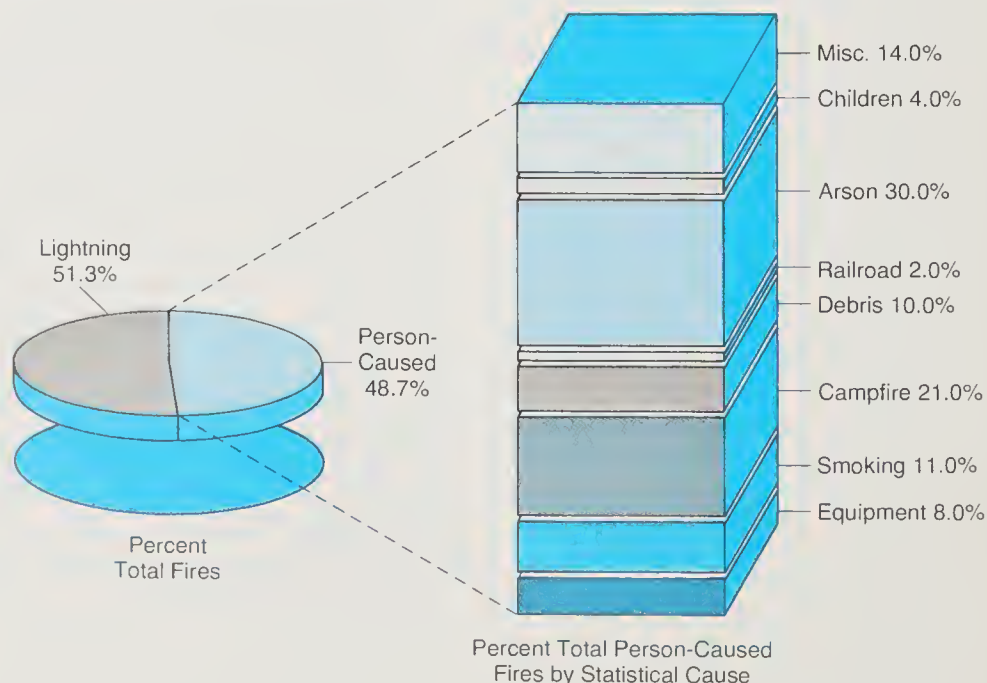
Early in 1986, representatives of the Forest Service, the U.S. Fire Administration, and the National Fire Protection Association united in a common and cooperative effort to

reduce the potential fire problems associated with the increasing number of homes in the wildland/urban interface, an area where forests and homes meet and intermingle. This new initiative is targeted to a growing problem, which stems from an increase in population and a desire to live in "natural" settings. The goals are to educate the public about the severity of the issue, to stimulate State and local governments to implement preventative measures, and to provide professional expertise in this area for creating a more fire-safe environment for those living in the wildland/urban interface. The National Association of State Foresters and the Bureau of Land Management have recently joined this cooperative effort.

Examples of the growing problem are found in two fire-prone areas—the Southeast and California. Eleven States in the Southeast contain an estimated 800,000 homes that are at risk because of their location in the wildland/urban interface. In California, there are an estimated 7 million people living in fire-prone areas. The potential damages of wildfire are staggering in wildland/urban areas.

Initial products of the program include a publication, "Wildfire

Percentage of Total Fires by Cause Class National Forest System Lands Five-Year Average 1982-1986



Strikes Home", that focuses on the wildland/urban interface and how it affects fire safety. Also, a satellite broadcast that portrays the fire problems of the wildland/urban interface was developed and made available to all agencies and the Public Broadcasting System. Possible solutions include fire code changes, zoning standards, and insurance company incentives for reduced losses. The initiative has the potential to reduce property losses and suppression costs up to 50 percent, as well as enhance the environmental quality of Federal, State, and private lands. Continued emphasis will be on implementing the initiative through the Cooperative Fire Program.

National Advanced Resource Training Center

The National Advanced Resource Training Center provides advanced training in fire management, smoke management, and related resource fields. It offers courses in fire behavior, aviation management and safety, incident management, fire and resource management, and advanced minerals management, to name a few. In 1987, the Center sponsored 11 graduate-school-level courses in fire and fuel management. Students came from many different organizations and countries, such as the Forest Service, State fire organizations, the National Park Service, the Bureau of Land Management, the Fish and Wildlife Service, the National Weather Service, Canada, Mexico, India, Australia, and Argentina.

Much technology transfer takes place inside and outside of the classroom. In addition, many students become trainers within their own organizations, thereby multiplying the number of students.

Aviation Management

Aviation also plays an important role in fire presuppression and suppression activities. Forest Service aircraft, both owned and contracted, flew more than 64,000 hours in 1987; 80 percent of the flying was during the "Fires of September." The mobilization and suppression effort during that period required the use of the entire Forest Service fleet. In addition, contracted Boeing 727 airliners made 85 flights, and other

similar large aircraft made another 128 flights in suppression-related activities. Forty-seven air tankers and eight military C-130 aircraft, fitted with Modular Airborne Fire-fighting Systems, dropped more than a million gallons of fire retardant chemicals on rapidly spreading fire-fronts. Overall, mobilization and demobilization required the use of 356 flights by large commercial aircraft and military transports.

Forest Service aviation management personnel regularly inspect and certify contract aircraft. During 1987, 110 fixed-wing aircraft, 98 helicopters, and 279 pilots for regularly contracted aircraft were inspected. In anticipation of a severe fire season, they also inspected an additional 1,650 call-when-needed aircraft and 1,455 pilots. Many aircraft and pilots failed the initial inspection, while others were rejected because they did not meet Forest Service safety standards.

Federal Excess Personal Property (FEPP)

Another component of the Fire program that is instrumental in providing support to wildland suppression operations is the Federal Excess Personal Property program. Under this program the Forest Service loans used Federal property to State forestry agencies for fire protection. Aircraft, helicopters, fire engines, tools, pumps, and hardware are a few examples of excess personal property placed on loan to State Foresters. State and local fire protection organizations often modify or recondition this used equipment to meet their individual needs.

During the "Fires of September", this program played an important role in supporting suppression efforts. Fourteen S-2 aircraft (Navy Grumman Trackers) on loan to and modified into air tankers by the California Department of Forestry flew 341 hours, dropping over 600,000 gallons of retardants on fires in Northern California. Eleven O-2's (Cessna 337's) flew 253 hours on reconnaissance missions. Twenty-four military cargo trucks on loan to and modified into engines by the Wyoming State Forestry Division provided critically needed help on fires in the Shasta-Trinity and Klamath National Forests. The State of Texas also sent fire protection vehicles to help the fire suppression ef-

forts in Northern California. These are only a few examples of the program's applications that provide not only fire protection capability for the States, but are an essential part of the Nation's overall fire protection force.

During 1987, State foresters borrowed 897 vehicles and 17 aircraft, bringing the total number of loaned vehicles up to 12,128 and aircraft up to 211. The original cost of equipment currently on loan exceeds \$300 million. The program extends the useful life of Federal vehicles and equipment, thus using our resources more efficiently and providing lower cost fire protection capability for State and local fire agencies.

Rural Fire Prevention and Control Program

A primary element of the State and Private Forestry Cooperative Fire Protection program is the Rural Fire Prevention and Control Program. This program helps finance the collection and reporting of fire statistics that all agencies use to analyze and determine fire prevention emphasis areas. Financial assistance also provides training and equipping of State personnel for fire prevention and suppression. This program was especially important this year, as it was responsible for the many trained and qualified handcrews and engines that helped this Nation respond to the "Fires of September."

The program also helps train and equip local firefighting forces for interstate support and an overall more effective and efficient State fire protection program. These forces, because of their training and proper equipment, become an integral part of the Nation's fire protection service.

SPECIAL PROJECTS

Projects in this section are specifically funded as special projects by Congress.

Boundary Waters Canoe Area

The Boundary Waters Canoe Area Wilderness Act of 1978 authorizes the Forest Service to cooperate with the State of Minnesota in a program to intensify forest management on

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forest lands owned by the State, its counties, and its private citizens. The purpose is to mitigate the loss of timber production caused by incorporating forest lands into the Boundary Waters Canoe Area.

With \$2.8 million in Federal funds and \$750,000 in State-matching funds, accomplishments in 1987 included 31,787 acres of reforestation, 3,447 acres of timber-stand improvement, production of 21.7 million tree seedlings, marketing and utilization assistance for 5.7 million cubic feet of timber products, 18 miles of new road construction and general forest management and assistance on 16,398 acres. Federal funding is authorized for this program through fiscal year 1990.

Grey Towers National Historic Landmark

The Grey Towers estate is the former home of Gifford Pinchot, first Chief of the Forest Service and father of America's conservation movement. The Forest Service manages it as a National Historic Landmark. Grey Towers houses the Pinchot Institute for Conservation Studies and maintains active programs for outreach to the public, interpretation of natural resources, and interpretation of Forest Service heritage through its link to the Pinchot family history. Grey Towers is recognized as a "center of excellence" in conservation thought and in the identification, discussion, and resolution of current and emerging natural resource management issues.

During 1987, Grey Towers served as a host site for the American Camping Association Conference, a forest management seminar sponsored by the Agency for International Development, the Yale School of Forestry symposium on issues related to National Forest planning, the annual meeting of the Pennsylvania Game Commission, and many Forest Service gatherings such as the summer Regional Foresters and Directors meeting.

Through an outreach initiative, Grey Towers established a growing relationship with the New Jersey School of Conservation. Several hundred inter-city children learned about the Forest Service and basic forest resources and their wise use. Under the auspices of a private trust to the National Friends of Grey



Grey Towers, the former home of Gifford Pinchot, first Chief of the Forest Service.

Towers, a variety of conservation education programs for children, as well as a "living history" presentation, are in production.

Grey Towers' personnel provide on-the-job experience in historic site management to other Forest Service employees and share their skills with community groups and State and local governments. During 1987, the staff at Grey Towers gave about 1,000 tours of the house and grounds and discussed the Pinchot family and Forest Service roots and mission with about 12,000 visitors and school groups.

The variety of scheduled activities at Grey Towers, plus the availability of the site to the general public as a place of beauty to walk, think, and reflect, attracted about 20,000 visi-

tors during the year. Special events, including open houses in the Pinchot tradition at Christmas and the beginning of summer, attracted additional visitors. 1987 was the first full year of operation of a local Friends of Grey Towers committee, which sponsored six fund-raising events to fund special acquisitions and restoration of the estate.

Burton-Santini Act

The Burton-Santini Act (Public Law 96-586) authorizes the Secretary of Agriculture to make financial assistance grants to local governments within the Lake Tahoe Basin for the purpose of reducing soil erosion and water pollution. The program is done in cooperation with

Placer and El Dorado Counties, California, the City of South Lake Tahoe, California, and Douglas and Washoe Counties, Nevada.

In 1987, this act awarded \$1,438,285 million in grants to local governments for new projects. State and local funds matched these Federal funds with \$1,901,815 million.

There have been 35 projects funded through this financial assistance program. Most are in various stages of design or construction, with 15 projects completed to date. The reduction of erosion and the restoration of riparian areas are important accomplishments of the program.

TRANSFERRED PROGRAMS

Funds for these programs are transferred to the Forest Service from other USDA agencies.

Forestry Incentives

The United States is the world's largest importer of wood products. The Forestry Incentives Program (FIP) and the forestry practices of the Agricultural Conservation Program (ACP) provide financial incentives for owners of nonindustrial forest

lands to increase timber production through reforestation and timber-stand improvement. Funding of technical assistance for the forestry aspects of these programs is transferred from the Agricultural Stabilization and Conservation Service (ASCS) to the Forest Service. These funds support the State forestry agencies that provide technical assistance to landowners applying cost-shared forestry practices. These programs are necessary to help meet this Nation's wood supply needs and reduce imports. FIP and ACP account for much of the reforestation on nonindustrial, private forest lands.

In 1987, FIP resulted in an estimated 188,236 acres receiving treatment and ACP 97,931 acres. This includes 163,000 acres and 80,900 acres of reforestation for FIP and ACP, respectively. In 1987, \$3.2 million in ACP funds were available to landowners for emergency tree planting to reforest those areas severely damaged by the drought.

The Food Security Act of 1985 established the Conservation Reserve, a USDA program to remove highly erodible cropland from agricultural production. Participants receive annual rental payments for 10 years to keep land out of production. They

also receive up to 50 percent of the cost of establishing permanent cover on these lands. Under the legislation establishing the Conservation Reserve, Congress established a goal of 12.5 percent for tree planting out of a total goal of 40 to 45 million acres of land in the Reserve.

To date, after five enrollment periods, nearly 23 million acres have been placed in the Reserve. Tree planting on these lands totals about 1.3 million acres, or 5.4 percent. State Foresters, through State and Private Forestry, provide technical assistance to landowners to carry out tree-planting plans.

Currently, tree planting under the Conservation Reserve is proving to be the largest single tree-planting program in history.

In addition to meeting the objectives of the Conservation Reserve, tree planting under the Conservation Reserve enables farmers to achieve the requirements of Conservation Compliance by 1990. It also is contributing to meeting shortfalls in timber supply needs as identified in the recent study on the South's Fourth Forest.

Cooperative Watershed Activities

The Forest Service provides technical leadership under the forestry aspects of the small watershed (Public Law 566) and flood prevention (Public Law 534) programs, emergency watershed protection, and river basin studies. The Soil Conservation Service administers these programs.

In 1987, \$869,000 in river basin funds supported 45 studies to assess forestry-related aspects of existing flood damage, sedimentation, and soil depletion issues. Additionally, planning assistance was given to 59 small watershed projects, with a total cost of \$211,000. Land treatment measures totaled \$544,000 on 70 small watershed projects. Funds from these programs paid for land stabilization practices on critically eroding areas and financed State Foresters who provided technical assistance on forestry practices.

Flood prevention activities continued on the six remaining watersheds. A total of \$2.34 million went to erosion control and flood prevention on both public and private lands. For example, 275 acres of critical area stabilization were accomplished on the Los Angeles



Tree planting: An American Heritage—private landowners participating in a variety of USDA cooperative cost-share programs often plant their trees by hand to improve land productivity or reduce erosion.



State forestry agencies and the Forest Service assist farmers who enroll in USDA Conservation Reserve Program. Technical review of tree planting techniques on erodible cropland ensures quality and improves seedling survival.

River project. This included the restoration of vegetation in riparian areas and gully control in upland areas. Cost share agreements with the Los Angeles County Department of Public Works covered some of this work.

The Soil Conservation Service allocated \$932,000 to the Forest Service in 1987 for emergency watershed-protection projects, including the treatment of hazards to life and property on National Forest System lands, primarily in California and Utah. There was work initiated to control debris flows from a recently burned area above Lindon and Orem, Utah. A heavy rainstorm caused flooding, damaged local water supply intakes, and threatened the aquaduct-serving part of Salt Lake City. Uinta National Forest personnel worked with local governments to protect residential areas and restore watershed conditions.

Cooperative watershed activities were primarily concerned with State nonpoint pollution-control programs. Work is continuing on training and the application of best management practices. State foresters began organizing and coordinating forestry inputs to State activities required by the 1987 Water Quality Act.

The Forest Service continued to cooperate with the Office of Surface

Mining in planning and conducting mine reclamation courses, which covered soils, hydrology, and management. During 1987, 380 trainees took 19 courses. Students are primarily State and Federal regulatory personnel.

Rural Community Fire Protection

The Rural Community Fire Protection program is expected to become a major component in effectively dealing with this Nation's wildland/urban fire protection problems. The Forest Service administers this program using funds transferred from the Farmer's Home Administration. Funds are available for small, rural communities to organize, train, and equip fire protection forces. Matching funds from States and community fund-raising efforts provide an efficient and effective rural fire protection resource.

During the "Fires of September", many volunteer fire organizations trained under and used equipment purchased through this program; they served as strong support for Forest Service crews. This support allowed for a higher level of protection than would have otherwise been available. The strong community relationships developed with the Forest Service as a result of this program increase the Forest Ser-

vice's overall ability to effectively manage the resources and provide important linkages to better serve the public.

Resource Conservation and Development

The Forest Service is responsible for the forestry provisions of the Resource Conservation and Development Program, which is administered by the Soil Conservation Service. In 1987, funds allocated to the Forest Service totalled \$643,000 for 46 of the authorized 189 project areas throughout the United States. The funds were 80 to 20 cost-shared with 28 State forestry organizations and provided forestry technical assistance to local leaders in rural areas to contribute to rural economic development. The program offers an excellent opportunity to plan and work with State and local units of government and local non-profit organizations in rural areas to implement local forestry goals and objectives. This program offers assistance to local leaders to help build a strong and diversified economy in these areas.

Forest Research



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INTRODUCTION

The Forest Service research program is responsible for developing scientific and technical knowledge to enhance and protect the economic productivity and environmental quality of America's 1.6 billion acres of forests and associated rangelands. Research is generally long range and high risk, covering a wide spectrum of biological, economic, engineering, and social disciplines.

Our research extends to nearly every major terrestrial ecosystem. The geographic range of the program is from the tropics to the Arctic and from Hawaii and territories in the Pacific to Puerto Rico in the Atlantic.

We conduct research through eight regional Forest and Range Experiment Stations and the Forest Products Laboratory in Madison, Wisconsin. More than 2,800 studies are in progress at any one time. Approximately 710 scientists are stationed at 76 locations throughout the States, Puerto Rico, and the Pacific Trust Islands.

The Forest Service plans and coordinates its forest research program with related efforts at the 61 forestry schools and the agricultural experiment stations of Land Grant institutions throughout the United States. Forest Service scientists also work closely with researchers from other public agencies and the forest industry. Many of the scientific accomplishments described in this report will be used to help manage our national forests. New technology will be transferred to these land managers, Federal, State, and local policymakers, and to the wood-based industries through publications, symposia, workshops, and direct public contact (table 53).

The research program also supports international forestry through cooperation with other Federal agencies, the United Nations, and bilateral arrangements with a number of foreign countries.

The 1985 RPA program emphasizes research to develop new and better ways to increase the production of market resources and other forest-related values on forests and rangelands and to protect and enhance the environment. Under the RPA program much of the research is aimed toward solving problems

relating to intensified, multiple-use management of the forest resource, while a program of basic research is maintained to generate new knowledge in key problem areas in biology, engineering, and the social sciences.

In 1987, as in previous years, the Forest Service emphasized research that would improve efficiency of natural resource management and production systems, strengthen and support Federal action programs and international initiatives, protect the natural resource base, and serve critical consumer interests. We gave priority to maintaining research programs for increasing forest productivity and timber utilization, controlling environmental impacts of mineral extraction activities, enhancing forest protection, and developing technology for multiple-resource management, basic biology, and atmospheric deposition.

In 1987, research appropriations totaled \$132 million, approximately 11 percent of which supported cooperative studies with colleges, universities, other research organizations, and industry (tables 51 through 53). The Forest Service transferred an additional \$6 million to the Cooperative State Research Service for administering the Forestry Competitive Grants Program. In addition, the Forest Service received \$21.8 million from sources other than Forest Research appropriations, such as other governmental agencies and the private sector. Of those outside funds, \$5.6 million was awarded in turn for extramural research.

Priority Research Programs

Many of today's natural resource problems are large, complex issues that cover broad geographic areas—issues such as the interaction between threatened wildlife species and timber harvesting. Some of these issues are the subject of intense public policy debate, such as atmospheric deposition and international trade in forest products. Often, a lack of important information accentuates such public policy debate. The Forest Service has one of the few natural resources research programs with the breadth of scientific expertise, long-term continuity, and broad geographic scope to successfully address such issues

through an integrated program of research.

To provide advanced knowledge on several important issues, the Forest Service devoted efforts in 1987 to developing integrated research in six priority research programs. Each of these programs builds on a foundation of existing expertise and addresses an issue that requires the type of long-term integrated research program for which the Forest Service is well suited.

Forest/Atmosphere Interactions

The possible biological effects of acid rain and other air pollutants on forests have become a major environmental issue in the United States, affecting even our relations with neighboring countries. Our atmospheric deposition research focuses on determining its chemical characteristics and assessing its effects on terrestrial and aquatic ecosystems. The Forest Service is also evaluating the current chemical climate of wildlands to find out whether and how land and water resources are changing in response to acid rain. Our research in this area is a major part of the interagency National Acid Precipitation Assessment Program (NAPAP).

We are studying atmospheric deposition in the following ecosystems: California and Pacific Northwest forests, Rocky Mountain high-elevation forests and alpine ecosystems, commercial pine forests of the South and Southeast, eastern mixed hardwoods, and the spruce forests of the East.

Our current research has determined that sulfate deposition is increasing in the Southeastern United States, and some watersheds can no longer buffer its acidifying effects. Soil organic matter plays a key role in reducing the effects of acidic rain on leaching of soil nutrients in New England. Peat, if present in soils, absorbs acidic deposition rather than passing it through to lakes in peatland watersheds. Acidic rainstorms and rapid melting of acidic snow increase the acidity of lakes and streams, but this effect is only temporary. Watershed studies in New England, Pennsylvania, the central and southern Appalachians, the northern Lake States, and the South-Central United States have determined how watersheds interact with

acid rain to produce changes in soil, water, and vegetation.

Acidic deposition is only one atmospheric characteristic that affects forest and rangeland health. Other forest/atmosphere interactions, such as temperature, and precipitation from changed chemical composition, also are potentially important. Therefore, the Forest Service initiated plans to broaden the current atmospheric deposition research program to encompass research on other forest/atmosphere interactions as well.

Wildland/Urban Interface

Where large urban areas are adjacent to State, Federal, and private forest lands, the intermixing of cities and wildlands has created major problems in fire protection, land-use planning, and recreation impacts. The possibility of serious fire disasters increases as recent fires in the South, Southeast, and West attest. The Forest Service is currently developing fire safety and planning guides, fire-behavior prediction systems, and fire-suppression tools for these unique fire-prone areas.

The presence of large communities adjacent to forest lands is changing the nature of wildland recreation in these areas. Crowds, large organized groups, activities involving off-road vehicles, and hang gliding are replacing picnicking, camping, and hiking. Unacceptable degradation of recreation sites often follows these changes in use.

Our research program integrates fire research and research on recreation opportunities to focus on improved communication with users (especially non-English-speaking ethnic groups), accelerated vegetative rehabilitation of overused areas, fire-behavior prediction in interface areas, fire safety and prevention guidelines, and land-use planning to minimize the fire hazards created by mixing structures with wildlands.

International Trade in Timber and Wood Products

Although we export about 15 percent of the timber products we produce, America is the world's largest importer of forest products. With a vast forest resource base, the Nation could become a net exporter of forest products and thereby increase domestic employment and help im-

prove the overall foreign trade balance.

The Forest Service's economics research helps policymakers formulate strategies for increasing exports of wood. We analyze current trade flows, identify factors influencing these flows, improve methodologies for trade analyses, and assess the present and prospective effects of international trade on domestic timber resources.

Our current research program has identified the Caribbean area as a major market for American forest products, especially southern pine structural lumber. Exports of eastern softwood solid wood products totaled \$350 million in 1985 and went primarily to western Europe, the Caribbean, and Canada. Currency exchange rates between the United States and Canada favor increased importation of Canadian forest products, but other cost factors are even more significant. The general lifting of tariffs on trade between the two countries, agreed to in the early fall of 1987, is not expected to affect timber import/export activity because lumber and wood products are specifically excluded from the agreements.

We developed plans to expand this research through accelerated study of such areas as the effect of international trade on domestic forest resources, the role of currency exchange rates on international trade, the effect of tariff and nontariff barriers on forest products trade, and the effect of changing pulp-manufacturing technology on world trade in pulp and paper products.

Biotechnology and the Forests of Tomorrow

Biotechnology has the potential to advance timber growth and pest controls more quickly than the conventional research methods. For example, biotechnology could lead to new lines of disease-resistant trees, nonchemical controls for insect pests, and major reductions in environmental damage associated with wood processing.

Our biotechnology research has found that it is possible to transfer a gene for herbicide tolerance from a bacterium into a hybrid poplar. This gene transfer could lead to more cost-effective control of unwanted forest vegetation. The discovery of an enzyme to break down woody

cells has opened the door for biotechnology in wood processing, biopulping, biobleaching, converting lignin to useful chemicals, and cleaning up noxious wastes from pulp and paper mills. In addition, biotechnology research may well lead to biological methods for controlling wood decay.

Building on the foundation of our current program, we have started planning research into areas that could improve tree growth rates, improve cold and drought tolerance, enhance nitrogen-fixed capabilities, and increase plants' tolerance to herbicides used in brush control.

Critical Wildlife and Fish/Timber Management Interactions

Complying with both the Endangered Species Act and the National Forest Management Act can result in conflicts between protecting wildlife and fish and producing a consistent flow of forest products from the resource base. In the Pacific Northwest, for example, significant acreages of old-growth Douglas-fir forests may need to be reserved from timber harvest to maintain habitat for the northern spotted owl. Before we can wisely integrate species conservation with the production of forest outputs, we need more knowledge about wildlife and fish habitat requirements and their relation to timber management.

We are giving high priority to studying those species most likely to be affected by planned forest management activities—wildlife associated with old-growth forest habitats, interactions between timber management and fish, and threatened and endangered species.

For example, our current research has found that timber harvests can be increased by up to 20 percent from Florida's national forests without compromising the red-cockaded woodpecker's habitat or endangering the species' survival. Research on cavity-nesting birds and mammals has shown how to manage many of these species and still maintain efficient timber management programs in the old-growth forests they require.

The Forest Service has planned or initiated expanded research programs on critical interactions between timber and wildlife in a number of areas. With regard to the northern spotted owl, for example,

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our investigations center on this species' habitat use, movements, breeding activity and success, juvenile dispersal, prey ecology, and potential competition with barred owls. Results of this research will help minimize the economic impact of providing for spotted-owl habitat. We also have started to plan for similar research on the Sitka black-tailed deer in Alaska, the grizzly bear, elk and deer in Oregon, and the cold-water fish habitat in the Appalachian Mountains.

Southern Forest Productivity

Although we will depend on the South to produce enough wood to meet half the Nation's needs by the year 2000, the southern timber resource may not be able to support continued expansion of forest industries as it did in the 1970's. Net annual growth of softwoods has leveled off and in some areas has begun to decline. Mortality from insects and diseases is increasing at a significant rate. Increased harvests have brought softwood removals to a level above that of net annual growth throughout much of the South. A comprehensive review of the timber situation has revealed that, unless timber growth is improved, the South is facing a future of rising prices for raw materials, much lower rates of growth in timber harvests, and declines in employment in the forest industries.

The Forest Service has begun planning for accelerated research to meet future demands on this timber resource. The program will address how we can enhance timber production from southern forest lands, what the competing uses of the southern forest resource are and how conflicts of use can be avoided or resolved, and what management techniques are needed to ensure that increased timber production and other uses do not adversely affect the environmental quality of southern forest lands.

The program will use biotechnology to accelerate tree improvement and quantitative studies to better understand the biological processes and environmental factors affecting productivity. Research will seek to develop silvicultural alternatives for control or unwanted vegetation, integrated pest management strategies as alternatives to overdependence on chemicals, practices for both

timber and habitat management to maintain and protect wildlife populations and watershed values, and improved utilization methods of harvesting to extend and protect the resource.

LAND AND RESOURCE PROTECTION RESEARCH

Fire and Atmospheric Sciences Research

The objectives of this activity are to develop improved knowledge of the initiation, behavior, and effects of fire in forest and range environments, to apply that knowledge by developing better methods of preventing and controlling wildfires and using prescribed fires for enhanced forest resource protection and production, and to better understand atmospheric effects on forest productivity and health and biosphere/atmosphere relationships. Examples of 1987 research accomplishments follow.

- By law, Federal agencies must manage and protect "air-quality-related values" in wilderness areas. Until recently, however, there was no universally accepted standard for measuring air pollution and its effects. In 1987, Rocky Mountain

Station scientists and 25 Federal and university counterparts developed guidelines for measuring factors that could be indicators of pollutants deposited from the atmosphere. These protocols will help forest managers around the Nation establish the current physical, chemical, and biological condition of wilderness resources using the same procedures.

- Automated weather stations linked to a central computer by satellite are monitoring fire weather conditions in remote areas of America's forests and wildlands. Scientists at the Pacific Southwest Station have established procedures to locate new weather stations, around and in place of existing ones, to diagnose threatening fire weather conditions effectively. This work complements the Forest Service's efforts in learning to forecast potential fire severity for periods of a week, a month, or—in the not-too-distant future—a whole season. The major advantage of long-range weather forecasting lies in prepositioning crews and equipment where wildfires are most likely to strike.
- Prescribed burning is an invaluable tool for vegetation management, but we may lose it unless we can learn to control the smoke it pro-



This apparatus measures emission factors for broadcast burns of logging slash, including particulates, carbon monoxide and dioxide, and hydrocarbons. Here, the apparatus takes measurements from the convection column from a line of fire running up a slope during a prescribed burn in the chaparral fuel type of California.

duces. Researchers at the Pacific Northwest Station are assaying the size of particles in smoke and verifying their origins, either from prescribed fires or from sources such as automobiles, powerplants, or windblown dust. Newly developed computer models can predict the amount of emissions from a prescribed burn. In Oregon and Washington, using these models to determine when weather favors low-emission burning has already reduced emissions by more than 50,000 tons per year. In the South, our Topographic Air Pollution Analysis System predicts the atmosphere's capacity to disperse forest smoke. This system enables us to select the best times for using prescribed fire—times when its emitted particles will most likely disperse. Because smoke from prescribed burns has already been linked to traffic deaths by inhibiting motorists' vision, the system's methodology will make a direct contribution to the welfare of drivers in the rural South.

Forest Insect and Disease Research

Our insect and disease research develops technology that prevents or reduces forest and rangeland damage by insect and disease pests and that protects wood in use and storage from insects and decay. The results help develop environmentally safe and effective strategies for pest management and integrate pest management with forest resource management. Examples of 1987 research accomplishments follow.

- Forest managers can spray chemical or microbial insecticides to suppress populations of gypsy moth, a pest native to Europe. Making use of the insect's natural enemies would be cheaper and safer to the environment; however, only one such enemy—a virus—is established in North American forests. Cooperators from our Northeastern Station and the Illinois Natural History Survey have brought to the United States several strains of disease organisms native to European forests and have established at least one species in a Maryland gypsy moth infestation. The presence of this pathogen will curb the gypsy moth by enhancing the action of its native enemies, such as viruses, that attack stressed individuals.



These poplars have increased resistance to Septoria leaf spot. The trees were derived from tissue-culture techniques ("cloning") in only 2 years.

- Like most insects, male ponderosa pine tip moths find their mates by scent (pheromone) that females exude when they are ready to procreate. Researchers at the Pacific Northwest Station have developed a synthetic pheromone that disrupts normal tip-moth-mating communication by attracting the males to artificial releasers of the synthetic pheromone instead of to female moths. Male moths respond to the stronger attractant odor emitted by the artificial releasers and are unable to locate females. In one test area, using the synthetic pheromones reduced larval populations as much as 83 percent below normal in ponderosa pine plantations, and shoot damage to young pines fell proportionately. This control method is target-specific to the pest and environmentally safe.
- Propagating trees that have natural resistance to disease is difficult, partly because the growth cycle of trees is so much longer than that of crop plants. Two important discoveries in Forest Service laboratories have paved the way to faster reproduction of resistant trees. Scientists at the Southeastern Station have developed a test to determine whether young pine seedlings are resistant to fusiform rust, the most destructive disease of southern pines. If resistance established in the lab is also found in the field across several pine families, we will adapt the test for use in plantations and seedling nurseries. Eventually, nursery managers may be able to propagate only pines

with natural resistance to fusiform rust. At the North Central Station, scientists have used tissue-culture techniques to produce and select disease-resistant poplar trees in the laboratory in 2 to 5 years instead of the usual 25 to 30 years required for conventional breeding. They have selected poplars resistant to Septoria leaf spot for integration into a line of genetically improved poplars.

Forest Inventory and Analysis

This activity provides comprehensive, continuing information and analyses of the characteristics of forest land resources of the United States. Forest industries, financial consultants, and State resource planners use forest inventory data, monitoring surveys, and results of analyses as a basis for industry expansion decisions, financial investment analysis, State forestry programs, and public and private forest policies.

- Law requires that the Forest Service make extensive surveys of America's forest resources. Obtaining data at lower cost is a major research focus at several experiment stations. One obvious way to save money is to develop techniques for estimating, rather than physically measuring, the resource. We will soon use multispectral satellite data, along with high- and low-altitude aerial photography, to estimate such things as vegetative cover and timber volume. For timber sales and updates of our forest surveys, regression techniques

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Between 1982 and 1984, the nationwide average period between successive forest inventories slowed from 10 to 14 years. Funding in 1985 permitted restoration of the 10-year cycle, which has been maintained through 1987.

coupled with improved sampling procedures promise considerably more reliable information at current costs. Efficiency can be improved up to 70 percent in estimating timber volume, up to 57 percent in updating State-wide volume estimates, and up to 47 percent in timber sales.

- Industry analysts and State resource planners depend on information from forest inventories in planning industrial development and resource management. To be useful, the inventories must be up to date and easy to retrieve and interpret. In 1987, we inventoried 45 million acres, which translates into an inventory cycle of 10 years nation wide. In the North Central States, we have made our inventory data accessible on a computer through the University of Minnesota. In the South, we put together two data retrieval packages for information requestors. We standardized our data sets nation wide, and we make our field data available to people who want to perform their own statistical analyses.
- Some tree species have been growing more slowly in New England since the early 1960's, and

atmospheric deposition ("acid rain") is one suspected cause. A check of cores from the trunks of 23,000 trees indicated growth declines in red spruce and balsam fir but not in other major species of the region. Eastern white pine—a tree thought particularly sensitive to atmospheric deposition—enjoyed a growth rate 38 percent greater than the second-fastest-growing species. It seems that the normal aging process in the spruce-fir forests of the Northeast may really be the "cause" of lowered growth rates.

Renewable Resources Economics Research

Our economics research develops and applies methods for analyzing the responses of domestic and international forest-products markets to economic and institutional forces and for structuring economically efficient forest management activities. Research contributes directly to national forest management decisions and the design of both public and private forest management programs. Individual landowners and forest-products processing firms use

the results to manage their resources efficiently.

- In the West, accelerated rates of harvest from private timber lands during the late 1970's and early 1980's cannot go on forever. In 1987, Intermountain Station scientists led a multiorganizational effort working on how to project biological and economic consequences of alternative harvest levels from timber producers in Idaho and Montana. The results indicate that even where supply problems are expected on industry-owned lands by 2000 or 2010, regional harvest levels need not drop below current levels. Some increases in planned harvests from National Forest System lands can partially offset these harvest declines, as well as increases in harvests from other ownerships or changes in within-state log-flow patterns.
- Figuring out how much research is worth depends on the answer to one question: By how much does the value of the products of re-



Containerized pine seedlings survive more reliably than bare-root seedlings. Our research on this technology returned up to 111 percent on the Forest Service's incurred costs.

search exceed the cost of producing them? North Central Station economists analyzed the value of the research on containerized tree seedlings by calculating the rate of return on the investments leading to the containerization technology. First, they measured the benefits of research as savings to consumers; then they estimated what it cost to do the research. By comparing benefits to costs, the investigators calculated the average internal rates of return from the investment in this research at 37 to 111 percent. These rates suggest that containerized seedlings were a profitable investment for the United States. This evaluation and similar exercises support the conclusion that the rates of return on forestry research are at least equivalent to those for agricultural research.

- Countries of Western Europe and the Pacific Rim account for the second-largest share (behind Canada) of U.S. hardwood exports. But these nations want rough dimension lumber in sizes different from the American standard. Northeastern Station researchers have developed a set of standard sizes for these markets that will make importing U.S. timber extremely attractive. The big advantage is that these new standard sizes can be made from abundant second-quality hardwood lumber.

Southeastern Station indicated, however, that application of three popular herbicides in Florida did not affect the quality of ground water near the surface. Herbicide residues degraded rapidly in the warm, humid environment. Repeating the experiments in the steeper terrain of Georgia's Piedmont and the Appalachian Mountains proved equally reassuring. Allaying citizens' fears about herbicide safety is mandatory if this important and economical management tool is to remain available to foresters.

- Selecting from several loblolly pine management systems is easier now thanks to Southern Station research that compared three silvicultural management regimes over a 50-year period. If owners want maximum pulpwood production, they should elect intensive plantation management. For highest output of sawlogs, they can use that option or choose the less-expensive uneven-aged management regime and get comparable results.
- Before the Forest Service can use biotechnology for improving forest trees, it needs to know much more about how parents in tree species pass genes to offspring in tree species and how genes are switched on and off to regulate growth. Studies of pines at the Pacific Southwest Station revealed that the

genes responsible for key reactions in photosynthesis (and ultimately in the making of wood) are inherited strictly through the paternal parent line. Genes responsible for respiration, which makes energy available for plant growth, derive from the maternal parent only. To improve the photosynthesis or woodmaking, therefore, biotechnical methods must be applied to the male (pollen-bearing) parent. To improve energy metabolism, the techniques must be applied to the female (egg-supplying) parent. The situation is exactly opposite in most crop plants (where the principles of biotechnology have been more widely applied to date).

- In another study, scientists isolated two genes of Monterey pine that direct the production of the enzymes important for respiration in very wet or flooded soil. The oxygen-poor conditions that prevail under flooding switch to one enzyme, while the other is on constantly. The on-off enzyme may prove important in engineering trees for tolerance to waterlogged soils. More significantly, researchers can use this enzyme to learn how genes are regulated in conifers. That knowledge is crucial to regulating novel genes that scientists will purposely introduce from other plant species to improve the qualities of pines.

RENEWABLE RESOURCE MANAGEMENT AND UTILIZATION

Trees and Timber Management Research

This activity seeks to develop improved silvicultural alternatives and management guidelines needed to increase the productivity and multiple-use benefits of forest lands, to maximize the growth and quality of trees, and to maintain land productivity. Timber management research ensures that the information and technology needed to achieve full productivity are developed and promptly made available.

- Southerners are concerned that herbicides used to control unwanted vegetation in pine plantations could contaminate drinking-water supplies. Studies at the



Plantation management like this maximizes pulpwood volumes and sawlog production in loblolly pine stands, but even-aged natural management is more cost effective.

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Watershed Management and Rehabilitation Research

Our watershed research aims to develop and test new, cost-effective methods for rehabilitating lands disturbed by surface mining and for protecting, managing, and improving forest and rangeland watersheds. Such research helps planners and managers meet long-term water quality and flow needs, rehabilitate surface-mined lands, and determine the relationships between land uses and water quality and flow.

- Fish habitat in southeast Alaska can be damaged when unstable slopes erode, depositing soil and debris in stream channels. The land's ability to regenerate forests is also impaired when organic layers and mineral soil wash away—an event that may follow clearcut logging. Cooperative research between the Pacific Northwest Station and Oregon State University has led to the development of engineering and hydrologic data bases for southeast Alaska, plus a risk-assessment procedure that can help spot potentially unstable natural slopes before they are logged or selected for road-building sites.
- In the arid Southwest, the fragile green corridors that shade mean-

dering streams are critical wildlife habitat, especially for breeding birds. Stream hydrologists and wildlife biologists at the Rocky Mountain Station have discovered how to use dams and bank-protection structures to modify channel flow and influence sediment deposition. This creates conditions favorable for riparian trees and shrubs. Hydrologists are developing guidelines so land managers can extend and make more secure their riparian ecosystems. At the Intermountain Station, scientists initiated research to develop accurate, repeatable, and standardized methods of measurement, analysis, and reporting for data on riparian-stream habitats. "Methods for Evaluating Riparian Habitats With Applications to Management" summarizes available tools for evaluating such environments and addresses the broad areas of overlap between the needs of riparian-stream organisms and livestock grazing.

- The water in some American lakes is becoming more acidic, and many people blame "acid rain" for this phenomenon. Some lakes seem much more responsive to atmospheric deposition than others. In Minnesota, Wisconsin, and

Michigan, the Forest Service found that clear-water lakes—those without much peat in nearby soils—tend to become more acidic in proportion to increases in precipitation acidity. On the other hand, colored-water lakes—those fed by streams that pass through peatland—do not become more acidic when precipitation deposits sulfates throughout their watersheds. Different landscape types retain different amounts of sulfate from the atmosphere. Red pine forests growing on thin, sandy soil over bedrock allow the greatest amount of aerially deposited sulfates to pass through to lakes. Black spruce forests growing on peatland retain about 80 percent of the aerially deposited sulfates.

Wildlife, Range, and Fish Habitat Research

This research develops knowledge and technology for maintaining or improving wildlife and fish habitat, for improving soil stability, vegetative cover, and the condition of rangeland, and for integrating wildlife, fish, and livestock with other forest and rangeland uses. Research results help managers understand the complex relationships among habitat quality, growth and response of vegetation to defoliation, other land uses, and wildlife and fish populations. The goal of this research is to ensure diverse, well-established habitats and to conserve and improve productive rangeland ecosystems.

- In 1987, researchers at the Pacific Northwest Station and the University of Idaho evaluated how stream-side shadecover influences the distribution and abundance of juvenile chinook salmon, an important local fish species. Studies revealed that numbers of fish and their total weight were two to four times greater in artificially shaded test sections of streams than in adjacent, unshaded control sections. Overhead shade does not supplant submerged cover, such as that provided by rocks and large woody debris, but managers can manipulate overhead shade to foster better rearing conditions for salmonids.
- Research on black bears native to the aspen-birch-conifer forests of Minnesota has revealed what kinds of habitat managers must encour-



Measuring the angle of an out-sloped stream bank, researchers decide if a particular area will be a good habitat for salmon or trout. If the bank angle exceeds 90 degrees, the fish gain almost no protection from the view of predators.



In Northern Minnesota, the abundance of fruit and nuts dictates the age when female black bears start producing cubs (4 to 8 years), intervals between litters (2 to 4 years), cub survival to age 1½ (59 to 88 percent), and annual home range.

age if they want to increase black bear populations. The abundance of berries, nuts, and acorns dictates the reproductive success of adults and survival of cubs. If such foods are in short supply, black bears will travel over 125 miles outside their normal home range in search of more hospitable living conditions. To improve the quality of black-bear habitat, forest managers must maintain a variety of food-producing habitats across the landscape, from forest openings to mature, mast-producing forests with closed canopies.

- Because of the popularity of hunting and fishing in the South, owners of forest land there can make more money by managing their properties for timber and wildlife rather than timber alone. Forest management decisions critically affect habitat suitability for such species as trout, wild turkey, and deer. Prescribed burning, which the public often interprets as a threat to wildlife, actually encourages it by altering vegetation spe-

cies in favor of food plants. Herbicide applications, though seldom toxic to wildlife, do alter habitat composition; therefore, land managers hoping to enhance wildlife species should consider herbicide impacts. The Southern Station's report, "Managing Southern Forests for Wildlife and Fish," explains how managers can promote wildlife enhancement along with timber production.

Forest Recreation Research

Our recreation research provides land managers with the technology to supply more and higher quality outdoor recreation opportunities. It develops the knowledge to manage vegetation in and near urban areas for optimum economic, social, and environmental benefits.

- Working with researchers at the University of Michigan, North Central Station scientists discovered that bigger is not always better for urban forest parks. Park visitors prefer a feeling of spa-

ciousness, but this impression is unrelated to actual or perceived size of the park. By using trees, shrubs, or hills to screen adjacent developed property from view, park designers can achieve the perception of spaciousness in small open areas. Such designs create the illusion that the natural area extends beyond its real boundaries. This research shows that the open-space needs of urbanites can be met even in heavily populated areas with only small parcels available for parkland.

- In managing wilderness recreation sites such as trails and campgrounds, managers have to balance the desires of visitors with a mandate to protect extremely fragile ecosystems. Intermountain Station scientists studied the responses of six vegetation types to experimental trampling over three consecutive years and found wide variation in damage. Grassland tolerated 10 times as much trampling as the most fragile ground cover within a forest. Thresholds beyond which recreational use exerted an unacceptable impact varied between eight nights of camping and as little as one night's wear and tear. This work will help wilderness managers decide where to encourage or discourage camping and where to recommend dispersed as opposed to concentrated recreation.



This grassland vegetation near the Bob Marshall Wilderness in Montana proved to be the most durable to simulated recreational use and also recovered fastest when trampling ceased.

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Forest Products and Harvesting Research

The objectives of this activity are to provide technology to harvest and utilize timber more efficiently; to develop timber-harvesting and timber-transporting systems that are economical and environmentally acceptable; to improve the performance of wood products; to expand opportunities for exporting wood products; to reduce waste, costs, and energy consumption in wood processing; and to facilitate forest management and environmental protection through improved harvesting and use of wood.

- The Forest Service has long been involved in research on the utilization of low-quality hardwoods, especially in devising ways to remove or reduce defects during processing. At the Forest Products Laboratory, we found that by simply changing the order of steps in manufacturing structural lumber, we can greatly reduce warping. The new process, called Saw-Dry-

Rip, involves sawing green logs into planks, drying the planks to a uniform moisture content, and then rip-sawing them into lumber. The concept of "standard blanks," developed at our Princeton, West Virginia, Forestry Sciences Laboratory, also increases the usefulness of low-grade timber. Because 80 percent of the wood parts used in making furniture are less than 40 inches long, the industry no longer requires many clear, 8-foot specimen logs. Furniture manufacturers can use standard blanks made by gluing together defect-free segments of low-quality logs. A whole new industry has sprung up to fabricate this material for furniture and cabinet manufacturers. In addition, standard blanks have good export potential; both European and Asian countries are interested in purchasing this new product.

- With today's technology, it is not commercially feasible to make white paper without using chlorine bleaching compounds that eventually end up in the Nation's waters.

New research at the Forest Products Laboratory should help the pulp and paper industry eliminate this form of pollution. Our scientists have discovered a new way to bleach chemical wood pulps using only calcium or sodium sulfites and air, plus a catalyst. The by-products of this process are harmless and can be recycled into fresh batches of pulping liquor. Although experiments on this process are only now in the laboratory stage, sulfite-air bleaching could eventually give rise to completely chlorine-free bleach plants for brightening chemical pulps.

- Cable logging has become a viable method for harvesting trees in the East once again—after a 50-year hiatus—primarily because it requires a less-dense road system than rubber-tired skidding. Forest Service researchers at the Northeastern Station have patented a cable-logging carriage that promises to reduce cable-logging costs, making this environmentally desirable harvest method even better. The new system uses two loadlines instead of one, which means that the average number of logs (and weight) yarded in each cycle could theoretically double at no increase in cycle times or costs over a single pass with the old system.

INTERNATIONAL FORESTRY

The International Forestry Staff provides leadership, coordination, and direction for Forest Service activities overseas and in neighboring countries.

- We facilitated 26 cooperative research projects in eight countries. These addressed new technologies in agroforestry, fire management, insect and disease protection, regeneration, tree genetics, watershed management, and wood utilization.
- We conducted 19 science and technology exchanges with 18 countries in Eastern and Western Europe, Asia, Oceania, and Latin America. The Forest Service gained new tree and insect germplasm, data on atmospheric deposition, information on wildlife forestry relationships, and new technology on safety equipment for firefighters.
- We provided practical training programs in forestry and related



The paper sample on the left was produced without using chlorine to bleach the pulp to an acceptable shade of white. Sulfite-air bleaching will offer the paper industry a change to avoid the pollution problems caused by chlorinated organic compounds.

fields for more than 270 international visitors, including students and professionals from four dozen countries.

- With the University of Michigan, we cosponsored the third international seminar on forest resource administration and management, for 25 senior public forest-resource administrators from 19 developing countries.

Two international forestry programs work in close cooperation with the U.S. Agency for International Development (AID) and the USDA Office of International Cooperation and Development (OICD), primarily to assist developing countries. The Forestry Support Program (FSP) provides technical assistance to AID's natural resources projects worldwide as well as to Peace Corps foresters, helping to design, execute, and evaluate a wide range of field projects.

In 1987, the Forestry Support Program:

- Drafted an environmental assessment for a proposed forestry development project in Honduras.
- Evaluated a village forestry project in Uganda and a forestry and land-use project in Niger.
- Analyzed cacao agroforestry practices in Barbados, Grenada, and Honduras.
- Supported publication and distribution of "Management of the Forests of Tropical America: Prospects and Technologies," "Profiles of U.S.A. Forestry Schools," "Buffer Zone Agroforestry in Tropical Regions," "Economic Analysis of Forestry Plantations in Ecuador," and "Job Seekers Guide to Opportunities in Natural Resources Management for the Developing World."
- Added a social forestry coordinator and a food-aid and voluntary assistance coordinator to the staff, both funded by AID.
- Increased the FSP skills roster to 2,500 resumes from the forestry community, with special attention to recruiting women and minorities for the roster.

The Disaster Assistance Support Program reached full staffing during 1987. It helps provide the U.S. Office of Foreign Disaster Assistance with prevention, preparedness, training, and emergency relief for global natural disasters. The pro-

gram's 1987 activities included the following:

- Fire suppression training in Argentina and Venezuela and on-the-job training in the United States for Chilean and Ghanaian firefighters.
- Wildfire technical assistance for Argentina, China, and Guatemala.
- Locust control assistance in Senegal, Mali, and Niger.
- Landslide hazard assessments in Dominica and Honduras and earthquake simulation in Peru.
- A Forest Service operational plan for international emergency responses and a skills-roster process for disaster-related technical assistance and relief.

SPECIAL PROJECTS, COMPETITIVE GRANTS

The objective of the competitive grants program is to support fundamental research that addresses critical barriers to the advancement of scientific wood utilization, and to further knowledge of biological mechanisms of forest organisms and their ecological relationships that contribute to the health and productivity of forest resources. Congress appropriated \$6 million in 1987 to this program for forestry research and stipulated that the funds be equally divided between two areas: basic improved harvesting, processing, and utilization research and basic forest biology, including biotechnology.

The USDA Competitive Research Grants Office of the Cooperative State Research Service administers this program. Scientists selected from the research community serve as program managers or members of peer-review panels. Federal employees serve as associate program managers.

Procedures for awarding grants are based on a competitive evaluation process similar to that used by the National Science Foundation—a process concerned primarily with the scientific merit of a proposal. All qualified scientists in the United States are eligible for grants, including Federal scientists. In the 1987 program, we received 264 proposals requesting a total of \$41 million and competing for the \$5.688 million available for grants. Of these, 43 proposals were funded; the average

grant was approximately \$136,000 for a 3-year period.

In 1987, we funded Forestry Competitive Research Grant program proposals in the following fields:

Percentage of program funding awarded

Wood Utilization Program:

Chemistry & Biochemistry	48
Processing	23
Anatomical & Physical Properties	18
Structural Engineering	6
Harvesting	5

Forest Biology Program:

Genetics & Biotechnology	33
Physiology	29
Ecology	16
Pathology	14
Entomology	8

In 1987, 83 percent of the funds went to principal investigators working at colleges and universities, 14 percent went to principal investigators with the Forest Service, and 3 percent to principal investigators in private industry. Often, scientists from different institutions cooperate as coinvestigators on research projects.

The following are examples of research findings from grants awarded in prior years:

- A major advance in applying biotechnology to conifer research is that scientists now can clone conifer genes and introduce foreign genes into conifer cells. Working separately, Forest Service and university scientists have been able to clone pine genes essential to physiological processes and to successfully introduce a bacterial gene for antibiotic resistance into conifer cells. Studies also have established that the arrangement of genes in lodgepole pine is significantly different from that of the nonwoody plants previously studied. All these developments make genetic engineering more feasible and could result in the production of trees with more desirable properties.
- Xylose, an abundant sugar found in woody plants, is not fermented by ordinary yeasts because they lack the genes to do it. A university scientist has isolated and cloned genes for enzymes involved with xylose fermentation and then developed a technique for transferring the genes into yeasts. This development could promote

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greater utilization of woody biomass for production of alcohol fuels.

- Fractions of pine lignin—a surplus chemical that results from the Kraft papermaking process—have now been purified. Analysis of the chemical characteristics of these lignin fractions could lead to their utilization as an industrial raw material for production of adhesives, plastics, and other products.
- Researchers have developed a computer program and data base that simulates the action of machines used in forestry operations and wood utilization. This computerized base of knowledge describes the relationship between changes in design parameters and vehicle/machine motions, which will lead to improved and safer engineering designs.

Administration



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INTRODUCTION

Administration's job is to manage the Forest Service's organizational resources to most efficiently and effectively achieve the Agency's natural resource mission. As budgeted resources become more limited and land management issues become increasingly complex, we have focused Forest Service Administration efforts in 1987 on improving Agency productivity, better managing the existing human, capital, and information resources, and more fully informing and involving the American public with regard to forest management.

IMPROVING AGENCY PRODUCTIVITY

Management Improvement

Pilot Study. Like most Federal agencies, the Forest Service has built up a large and costly system of policies, processes, and procedures over the years to implement the hundreds of laws and regulations affecting the Agency. To continue to efficiently meet the expected demands for goods and services from the Nation's forest land in an era of declining budgets, we must dramatically reduce this bureaucratic workload and shift resources to more productive use.

Therefore, in 1985 we initiated the "National Pilot Study," in which we designated four national forests and a research station to test a less stringent control structure that encouraged innovation and creativity. The units were granted:

- Flexibility within basic policy and legal bounds to achieve agreed-on output targets and objectives, including waivers from certain requirements.
- Budgets allocated by appropriation rather than numerous line items.
- A process whereby ideas for productive change are generated from the bottom of the organization upward and are approved if legal and worth testing.
- Freedom to apply savings to other high-priority work.

In view of the study's success in 1986, we expanded the study in 1987 to include an entire region and another research station. In addition, some Regional Foresters initi-

ated numerous "Pilot type" efforts within the scope of their own authorities.

Test results through 1987 have continued to be extremely positive and exciting. The test units have relinquished many costly bureaucratic controls without creating undue waste or misuse; in doing so, they have increased productivity and improved service to the public. A renewed organizational spirit among employees at the test units is generating thousands of new ideas for achieving the Forest Service mission more efficiently and effectively.

We will continue the Pilot Study with the expectation that the spirit and changes generated will ultimately be transferred to the entire Forest Service, creating a better management climate, higher employee motivation, and overall increased productivity.

The Pilot Study is also influencing other government agencies and private organizations. We have made presentations on the principles and benefits of the Pilot Study's operating philosophy to other USDA agencies, the NASA Symposium on Quality and Productivity, Veterans Administration, Central Intelligence Agency, Senior Executive Association, Federal Executive Institute, Bureau of Land Management, City of Milwaukee, Oregon Department of Natural Resources, and many other entities in Washington, DC, and in the field. A Forest Service statement describing the nature of "risk taking" employed in the Pilot Study was distributed within and endorsed by Eastman Kodak Company. We anticipate continued strong interest from public and private leaders in the Pilot Study's principles and potential application to their own organizations.

Automation

We have implemented a major productivity improvement this year with the automation of purchase orders and contract preparation on our Service-wide computer network. First, we have started to use the Automated Purchase Order System (APOS), the first comprehensive system to automate the preparation of requisitions and purchase orders, to transmit purchase orders to the USDA National Finance Center in New Orleans, and to link APOS receipt documents to the automated



Microwave installation in Region 3.

property accounting system at the National Finance Center. A USDA system now being designed will incorporate the major elements of APOS. Second, by adapting the Agriculture Contract Automation System, a Department-wide system, we can now use that computer network to prepare contract solicitations and awards and to report the awards to a central data base.

We also enhanced the efficiency of personnel systems with three major systems improvements, which we expect will result in a one-time initial savings of \$1.5 million in operating costs. With the Personnel Information Management System, we now electronically process personnel documents, thereby replacing the handling of 400,000 hard copy documents a year. With the Position Management System, we can manage and track all Forest Service positions through an electronic system. And with the Electronic Time and Attendance System, we now are processing more than 50,000 time-sheets electronically each pay period, with more than 1 million processed during 1987.

Organizational Change

The Chief's Office, Regions, Stations, and Area continued to achieve savings in 1987, wherever appropriate, by eliminating staffs and other internal realignments,

sharing services between units, co-locating offices, and consolidating administrative units such as ranger districts and research work units.

The opportunities for some significant organizational changes, particularly consolidations, have not been realized in some areas because of public sentiment for retaining Forest Service offices in their traditional locations.

MANAGING THE HUMAN RESOURCE

Work Force Population

The Forest Service had 27,400 permanent full-time employees in 1987; this was close to the 1986 level, slowing the decline of the previous few years. Total employment peaked at 46,084 in July with the Agency's hiring of temporary employees for the summer field season.

Technical occupations made up more than half the total Forest Service work force, and professional occupations made up a quarter. The agency continued to reduce its clerical force, from 4,898 to 4,667, to capture efficiencies resulting from automation of office systems.

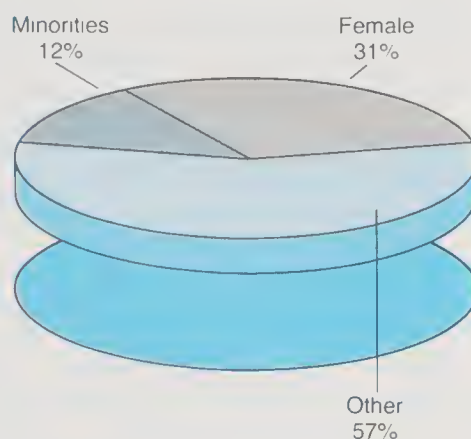
To increase efficiency in hiring, the Forest Service began using State employment offices in selected locations to fill temporary seasonal positions. This method not only met the Agency's recruitment needs, but also assisted the employment offices in fulfilling their responsibility for placing people looking for work.

Diversity

In keeping with our objective to diversify the work force, the Forest Service continued to increase its representation of women and minorities. Women constituted 31 percent and minorities 12 percent of the permanent work force. Together, women and minorities occupied 19 percent of the professional, 40 percent of the technical, and 63 percent of the administrative positions—a substantial increase in all categories over 1986.

Special efforts have resulted in a 50 percent increase in women and a 26 percent increase in minorities in key management positions. We now have women and minorities directing staffs at the Washington and regional office levels, and as assis-

1987 Permanent Workforce Composition



tant directors at research stations. In addition, there has been a noticeable upward movement of women and minorities into district ranger positions.

The Forest Service received special honor and recognition in July 1987 when the City Council of Philadelphia passed a resolution commending the Agency's Service-wide Civil Rights Committee for its work.

Special Programs

The Forest Service's human resource programs provide job opportunities and training for youths, the unemployed, underemployed, economically disadvantaged, and elderly while carrying out high-prior-

ity conservation work. These programs are the Job Corps, Senior Community Service Employment Program, Youth Conservation Corps, Volunteers in the National Forests, and Hosted Programs.

The programs offered employment and skills training to 80,718 persons during 1987, including many women and minorities. For a total investment of \$78.0 million, a value of \$87.5 million in accomplishments was returned (table 63). Participants built campgrounds and trails, planted trees, built fences, fought fires, improved timber stands, constructed office buildings, warehouses and roads, and provided clerical support.

Job Corps. Under the Job Corps program, which is funded by the Department of Labor, the Forest Service administers 18 Job Corps Civilian Conservation Centers, eight of which are coeducational. These Centers provide basic education and job training to disadvantaged youths between the ages of 16 and 22. The objective is to enable graduates to find productive work, reenter school, or join the military. In 1987, 85 percent of those completing the Job Corps program took one of these career steps.

The Department of Labor honored the Forest Service this past year by selecting the Agency as the overall "Number One Operator" of Job Corps Centers for the 1986-87 program year. This signified that the Forest Service excelled in all phases of center management—retention, placement, and educational gains. In addition, three Centers received individual awards.



Scottish instructor and a Curlew Job Corpsman working on the Dovecot in Scotland

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In 1987, the Forest Service participated in an international exchange program on youth training and employment in Scotland, where it shared information about the Job Corps program with Scottish officials. Officials of the Forest Service presented workshops and seminars, while members of the Corps demonstrated their learned vocational skills in an actual restoration project. This completed an exchange begun in 1985 when the Scottish Government visited the Forest Service-operated Job Corps Center in North Carolina.

In addition, we conducted a productivity improvement study in 1987 to identify opportunities for cost-saving measures in Job Corps operations. We identified actions that would result in more cost-effective management of the centers, yet would maintain the unique quality of training, placement, and services provided. These actions are now being implemented.

Senior Community Service Employment Program. Authorized under the Older Americans Act, the Senior Community Service Employment Program is designed to provide part-time employment and supplemental income to the low-income or disadvantaged elderly, training and transition of participants to the regular labor market, and community service to the public. The Department of Labor also funds this program. In the 1986-87 program year, enrollee accomplishments returned \$1.51 for each appropriated dollar. Of the participants, 16 percent were later placed in unsubsidized jobs.

Youth Conservation Corps. Enrollees in the Youth Conservation Corps, a summer employment program for young men and women aged 15 through 18, earn and learn while doing conservation work on National Forest System land. In 1987, the enrollees' work returned \$1.19 for each dollar invested.

Volunteers in the National Forests. The volunteers program offers individuals from all walks of life the opportunity to donate their services to help manage the Nation's natural resources. This program continues to grow in popularity as people realize how they can personally help carry out natural resource programs. This year, 57,298 volunteers—over twice the agency's permanent work force, helped deliver Forest Service



SCSEP enrollees rebuilding a boathouse on Lake Weddington. Boston Mountain Ranger Station, Ozark NF.

services on the ground and contributed 1,827 person-years of work valued at approximately \$23.8 million.

The Forest Service has a cooperative agreement with North Carolina Agricultural and Technical State

University to increase the number of minorities and women who participate in the volunteers program and who pursue careers in natural resources. A degree program in forestry and a course in volunteer management have been developed,



YCC enrollees preparing a water gabion. Smokey Bear Ranger District, Lincoln NF.



YCC enrollees earn and learn while doing conservation work on NFS land.

and there has been an increase in the number of freshmen entering the natural resource curriculums at the university.

The Touch America Project is a special volunteer program that gives young people between the ages of 14 and 17 a chance to gain job experience and environmental awareness while working on public lands. In 1987, private sector organizations sponsored 5,203 youths in the Touch America Project.

Hosted Programs. The Forest Service also provides conservation work opportunities for participants in programs administered primarily by State and local governments. Hosted programs include employment under the Job Training Partnership Act, College Work Study, Vocational Work Study, and Work Incentive.

MANAGING THE CAPITAL RESOURCES

Financial Management

The Forest Service has continued efforts to improve the efficiency and effectiveness of its overall planning, budgeting, and accounting system. A primary objective is to more accurately determine the costs of production where Forest Service managers need the data to make more informed decisions.

As part of a simplified process under the Pilot Study, we have allocated to field units budgets by appropriation totals, rather than by numerous detailed line items. Unit managers have the flexibility to move funds among their various activities and apply any savings to other high-priority work. We then track actual costs by detailed activities within the accounting system.

This procedure has proven successful to date in helping expand the unit manager's options and increase unit productivity. We are currently working with Congress to streamline the appropriation process according to the Pilot Study experience.

In 1987, we completed development and implemented a new accounting system that revises existing accounting codes. The new system includes the newly developed program activities structure for the Forest Service; initiates direct electronic input from all units to the National Finance Center; and provides, within the distributed-processing network, electronically available data and reports for all units. The accounting structure changes will now allow managers to account for funds by the activity being performed. The distributed-processing initiative allows for more timely and accurate entering and reporting of accounting data.

We began implementation of a cost-accounting system for the timber program, the Timber Sale Program Information Reporting System, and took steps to make it part of the official accounting system at the National Finance Center. This is the first step of a long-term effort to establish cost accounting for all resource programs of the Forest Service. We also changed the account-



Vocational Rehabilitation Program enrollee working as computer operator at the Forest Products Laboratory in Madison, WI.

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ing structure to collect and report the roads program in more detail. The Road Analysis and Display System uses accounting data to monitor the efficiency of road program management on a national, regional, and forest basis (see the National Forest System section for more information).

It also was an important year for improvements in the collections process. We implemented use of the Department of the Treasury "Lock-box" system in six regions and will do so in the remaining regions in 1988. The system sends payments from timber sales, grazing permits, and recreation uses directly to a single bank for next-day use by the Treasury, eliminating our work in depositing these funds. We also initiated electronic means for entering the preceding accounts receivables and the subsequent recording of associated accounting information. In addition, we began testing recreation site collections through credit cards. Finally, we implemented payment system applications that provide electronic input at the unit level for allocations, payments, special obligations, and assistant disbursing officer payments.

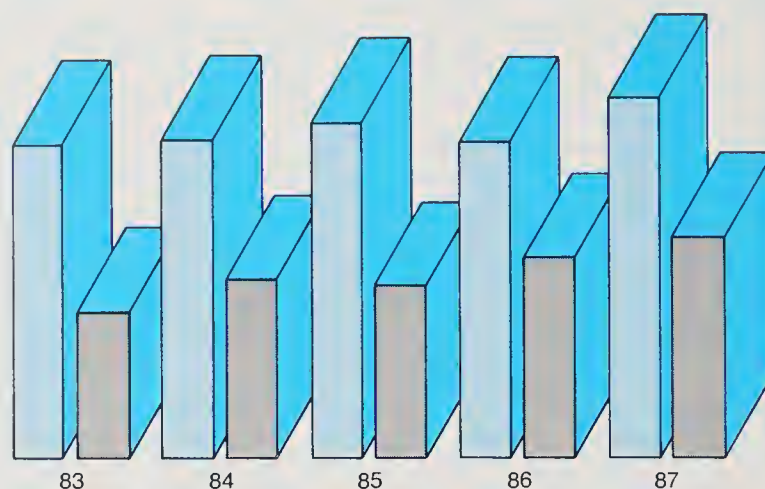
Receipts and Expenditures

Although the Forest Service receives its operating funds from Congress and various cooperator deposits, it also is a revenue-producing agency. In 1987, we received 62 cents of every dollar expended. Our 1987 receipts totaled \$1.46 billion, up 11 percent from 1986, while expenditures totaled \$2.35 billion, up 12 percent from last year.

We collect receipts primarily from timber sales, mineral leases and permits, grazing permits, and recreation uses. Timber receipts in the form of cash, deposits, and roads in lieu of cash totaled \$1.18 billion, or 81 percent of the total revenue in 1987. Receipts from mineral leases, royalties, sales, and bonus bids made up the second-largest revenue source with \$149 million, or 10 percent of the total.

By law, the Forest Service pays the States 25 percent of all national forest receipts. These funds are used for public schools and roads in the counties containing National Forest system lands. We paid \$262.1 million to the States in 1987 and \$7.3 million to counties from National

Expenditures and Receipts



(Million Dollars)					
Expenditures	2,061	2,095	2,199	2,078	2,351
Receipts	966	1,184	1,133	1,321	1,458
Receipts as percent of expenditures	46.9%	56.5%	51.5%	63.5%	62.0%

Grassland and Land Utilization Project receipts. Minnesota received \$716,148 under the Boundary Waters Canoe Area Wilderness Act. Table 55 lists additional Forest Service receipts and expenditure data for 1987.

Procurement and Property

The Forest Service continued to increase the efficiency and effectiveness of the procurement program through which we accomplish much of our land management work and service to the public.

In 1987, we spent approximately \$508 million, or about 24 percent of the budget, on more than 6,400 new contracts and more than 750,000 separate small-purchase transactions. This is a 20 percent increase over last year, with no increase in personnel. Contract awards included \$19.7 million to businesses certified as disadvantaged by the Small Business Administration, \$18.6 million to women-owned firms, and \$10.1 million to all other minority firms.

Our personnel managed the leasing of approximately 16 million square feet of space, including

space owned and leased by the Agency and space controlled by the General Services Administration. We also managed the acquisition, utilization, and disposal of personal property worth more than \$700 million, including property on loan to State forestry departments.

During 1987, high forest fire activity challenged Forest Service procurement personnel to provide an extraordinary level of support to fire suppression and rehabilitation while continuing to meet ongoing program needs. Fire support contracts provided for housing and feeding of firefighters, as well as equipment requirements. Obtaining the necessary goods and services at reasonable prices in the fire environment and helping to manage these resources once acquired are continuing challenges.

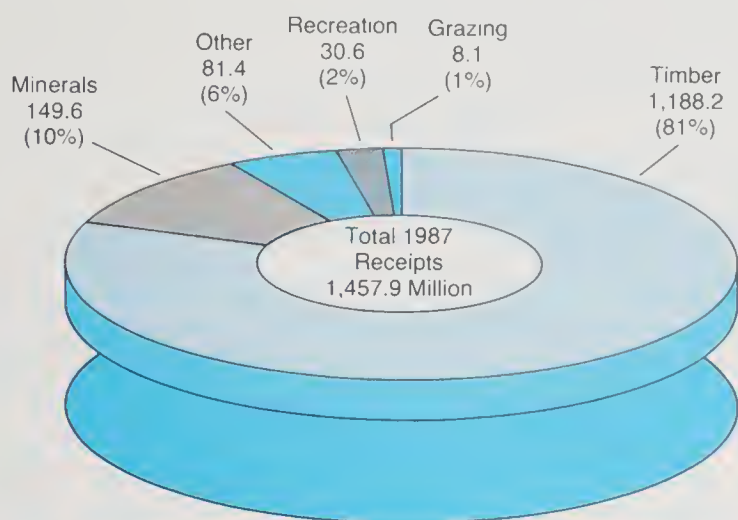
MANAGING THE INFORMATION RESOURCE

Information Structure

The Forest Service continues to place a high priority on information management. As with most large or-

Distribution of Receipts by Program

(Million Dollars)



ganizations, the Forest Service has determined that assembling, storing, manipulating, and transferring information are increasingly critical procedures for successful operations. Day-to-day decisions, as well as long-range planning, depend on the right information being available at the right time, at the right place, and in the right form.

We have designed a framework for efficiently organizing information we use to attain planned objectives. We also have developed a set of basic principles for use when building information systems that are to fit within the framework. For example, the Geographic Information System outlines a National strategy to display geographically locatable information for improved land management decisions. We developed an implementation model that ties together basic principles of data, information products, and technology. A system-controlled evaluation is under way to provide insights on what the Forest Service needs to facilitate its decision-making processes.

Distributed Processing

The Forest Service has reached its 1987 goal of supplying field offices with common word-processing, data-processing and telecommunications capabilities. This effort is 88 percent complete, and we now will place more emphasis on networking

the various systems. The National Finance Center is a major part of our total information environment, so we have begun efforts to decrease the paper flow and facilitate electronic data entry and retrieval between the Center and our distributed processing system. One of the highest priorities for 1988 is cost-effective telecommunications connection to the Center.

Other significant accomplishments during the year included the

procurement of software to facilitate networking of office work stations and their associated host computers. We also had a reduction in the cost of data transmitted through the USDA telecommunications network made possible through an innovative strategy that uses satellite technology, Forest Service Microwave systems, and new methods of communicating with USDA computer centers through remote batch. The estimated savings generated in 1987 will approach \$3.0 million.

INVOLVING THE AMERICAN PUBLIC

The forests of the United States are critical to the Nation's continuing social and economic health, but appreciation of this importance fades as more people move to the cities. We have taken several steps to revive the public's knowledge and appreciation of the numerous benefits that the forests provide.

Forests for Us. The Forests for Us program encourages people to write for a brochure, "America's Forever Forests," and to donate their talents to forest-improvement projects that can serve as working classrooms. The premise is that once people become aware of the benefits, they will be anxious to see that we maintain and manage our forests as renewable ones that provide those benefits for future generations. The



Northern Arizona University sophomore volunteers clear the Bell Train Beaver Creek Road, Coconino NL

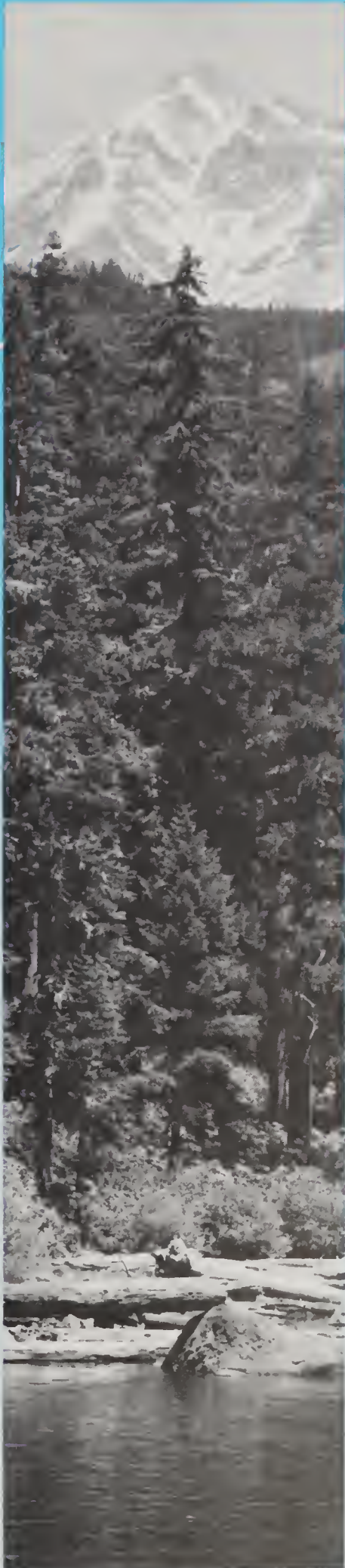
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focus for this program will be on the national forests, which belong to the American public.

This project is consistent with the Forest Service's support and participation during the year in a Government-wide outreach program called "Take Pride in America." The public service campaign educated and inspired citizens and organizations to take positive action in cleaning, maintaining, and responsibly using their public lands. Our personnel assisted the Secretary of Agriculture in organizing and carrying out the project, and Forest Service units conducted many volunteer projects throughout the country.

Natural Resource and Environmental Education. This program, which became active during the year, takes a longer range view of raising the public's knowledge and appreciation of forest resource management. The Forest Service began issuing education materials linking the learning process to real issues, problems, and environment. The purpose is to motivate the public to knowledgeably participate in natural resource management activities. The program complements Project Learning Tree, the American Forest Council's educational program, which the Forest Service sponsors in cooperation with the Society of American Foresters, the American Forestry Association, the National Association of State Foresters, and the National Forest Products Association.

Resources Planning Act



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INTRODUCTION

The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended, directs the Secretary of Agriculture to periodically assess the status of the Nation's forest and range resources and to recommend a Forest Service program for their management and use. The Act requires the Agency to develop an Assessment every 10 years and a Recommended Program every 5 years.

The RPA Assessment describes the Nation's renewable resource situation and projects supplies of and demands for these resources. The most recent Assessment was completed in 1979. A supplement to the 1979 Assessment was published in 1984 to account for changes that have occurred since 1979.

The 1985 RPA update is the third Recommended Program. It identifies a reasonable range of goals, management directions, outputs and costs for the long-term future. It provides the Congress and the public with an information base on which to continue their informed participation in the decisions affecting Forest Service programs.

In order to achieve long-term goals over the next 50 years, the RPA Program defines a course of action for Forest Service programs over the next five years. Each five-year update provides for reevaluation of policies and goals, and for incorporation of new information, such as costs, benefits, and available management technology. The Program addresses the management and administration of the National Forest System, for forestry research, and for assistance and leadership on private and State forest lands.

MAJOR FINDINGS OF THE ASSESSMENT

The 1979 RPA Assessment and its 1984 supplement found that demand for most products in the next five decades is likely to continue rising in response to a 34 percent increase in the Nation's population and a tripling of economic growth. The tabulation below shows the projected percentage increase in total National demand for selected resource outputs:

	Percentage Change from 1980	
	2000	2030
Timber	30	64
Range grazing	35	41
Downhill skiing	78	234
Hiking	17	59
Dispersed camping	33	105
Waterfowl hunting	33	69
Freshwater fishing	39	90

Resource supplies in the years ahead, based on continuation of recent management trends, would also increase, but not as rapidly as demands at current price levels. As a result, demand and supply will move to a new equilibrium position with associated impacts on the economy, the society, and the environment. Among these are the following:

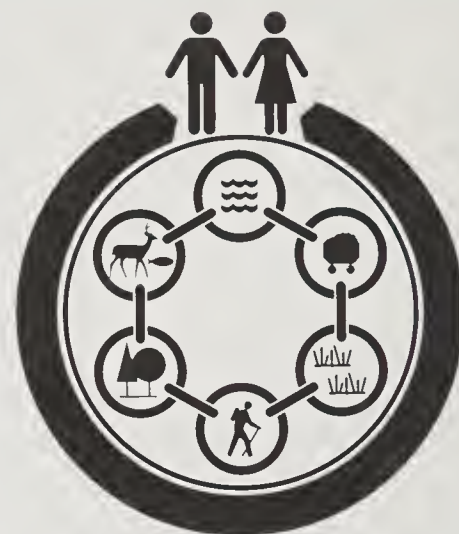
- Rising relative prices and related consumer costs, particularly for softwood timber.
- Increased dependence on wood substitutes and imports.
- Less satisfying outdoor recreation experiences.
- Rising environmental protection costs.

These negative effects will offset some of the benefits that would otherwise accrue from the projected tripling of consumer disposable income.

The Assessment also pointed out that the expected increase in the price of consumer outputs is not inevitable. Expansion of private investments as well as public programs could reduce expected price increases and the above negative effects.

THE RECOMMENDED PROGRAM

The Program is presented as a range of outputs and activities. To describe the scope of the Program, it is discussed in terms of the High and Low Bounds of the range. The High Bound begins to respond immediately to the Assessment and RPA goals. The Low Bound response to long-term goals is constrained at a constant level through 1990 to avoid adding to the Federal deficit.



The RPA logo illustrates integrated natural resource management for Americans. The small circles (from top and clockwise) depict the linked interrelationship in the multiple-use chain of resources: air and water; minerals and energy; range; outdoor recreation; timber; wildlife and fish. The outer circle symbolizes the national and continuous planning of the three major Forest Service program areas . . . National Forest System; State and Private Forestry; Forest Research . . . as exemplified by the RPA Recommended Program for the period 1985 through 2030.

The fundamental principle emphasized by the President's Statement of Policy in implementing the Program is to strive for judicious balance between:

- The needs of this and future generations.
- The need for wilderness and the need for timber, forage, and minerals.
- The need to produce direct economic benefits and the need to provide for nonmonetary benefits such as outdoor recreation.
- The need to invest in national forests and the need to meet other demands on the Federal budget each year.
- The share of costs paid by general taxpayers and the share paid by specific users.

Other broad policies that guide the program include:

- States should play a greater role in funding resource programs, particularly on private lands.
- Continuous research should be directed and managed to provide

for improved, more cost-effective management techniques for national forests and other lands.

National Forest System

The 1985 resource output response to national long-term goals for the National Forest System was developed using the most up-to-date information available from forest planning.

The following tabulation shows long-term program goals for the National Forest System at both Bounds of the Program:

		2000		2030	
	1986 Resource Output	Resource Output	Percent Change from 1986	Resource Output	Percent Change from 1986
Low Bound					
Minerals (thousand cases)	24	32	33	36	50
Recreation use (mm visitor days)	215	260	21	340	58
Wilderness (mm acres)	32	35	9	35	9
Range grazing (mm AUM)	9.8	10.0	2	10.3	5
Timber offer (bbf)	11.4	11.8	4	15.6	37
Wildlife & fish (mm user days)	23	23	0	28	22
High Bound					
Minerals (thousand cases)	24	36	50	38	58
Recreation use (mm visitor days)	215	310	44	400	86
Wilderness (mm acres)	32	38	19	40	25
Range grazing (mm AUM)	9.8	10.3	5	11.3	15
Timber offer (bbf)	11.4	14.0	23	20.0	75
Wildlife & Fish (mm user days)	23	35	52	40	74

Minerals. Workload in the minerals program is expected to grow rapidly during the first five years of the RPA Program in response to minerals demands. Processing permit applications will grow more slowly at the Low Bound, postponing some of the potential growth in economic benefits. At the High Bound, resource outputs are 50 percent higher by 2000 with accompanying higher benefits.

Recreation. In order to meet future goals in the recreation program, the early years of the Program capitalize on other resource management activities and volunteer programs to help meet increasing demands in a cost-effective manner.

Emphasis is placed on improving and maintaining existing facilities and trails.

The recreation use graph for Federal lands indicates that about 40 percent of such recreation use occurs on National Forest System lands. The High Bound of the RPA Program would maintain this share of the Assessment projection of future use; at the Low Bound, the national forests would be expected to provide about a 7 percent lower share of the total, or 33 percent of total Federal Recreation User Day (RVD) use.

The Program projects a 10-25 percent increase in wilderness acreage. The primary activities to protect wilderness values are improvements to the trail system and administration and management of the wilderness system for all wilderness uses.

Range Forage. Range management in the first five years of the Program emphasizes improvement and maintenance of resource productivity. The range use graph shows historical U.S. and national forest totals, as well as RPA Assessment projections. Grazing on National Forest System lands is a small portion of the total; however, much of national forest use is seasonal

and complements cattle and sheep operations on adjacent private lands. The RPA High and Low Bounds maintain national forest grazing use at current levels through 2000.

Timber. Despite higher timber goals in the future, timber offered for sale would increase only slightly through 1990 at the High Bound and would decline by about 20 percent at the Low Bound. As shown in the graph, harvest rises at both Bounds after 1990. To meet long-term goals, the Program relies on new technology to provide additional economic opportunities and cost reduction to raise the efficiency of the program. The higher timber output, with other rising outputs, would contribute to community growth.

Reforestation and timber-stand improvements are increased in early years to support harvest levels at the High Bound. At the Low Bound, these activities are held constant through 1990, which will defer some timber-stand improvement until after that time.

The timber demand and harvest graph compares U.S. and national forests totals, as well as RPA Assessment projections. During the early 1980's, Assessment projections were high relative to actual total U.S. harvests. National forest harvest was 16 percent of the U.S. total harvest in 1986. At the RPA High Bound in 2000, National forest harvest is 14 percent of the projected U.S. total; at the Low Bound, it is 11.8 percent.

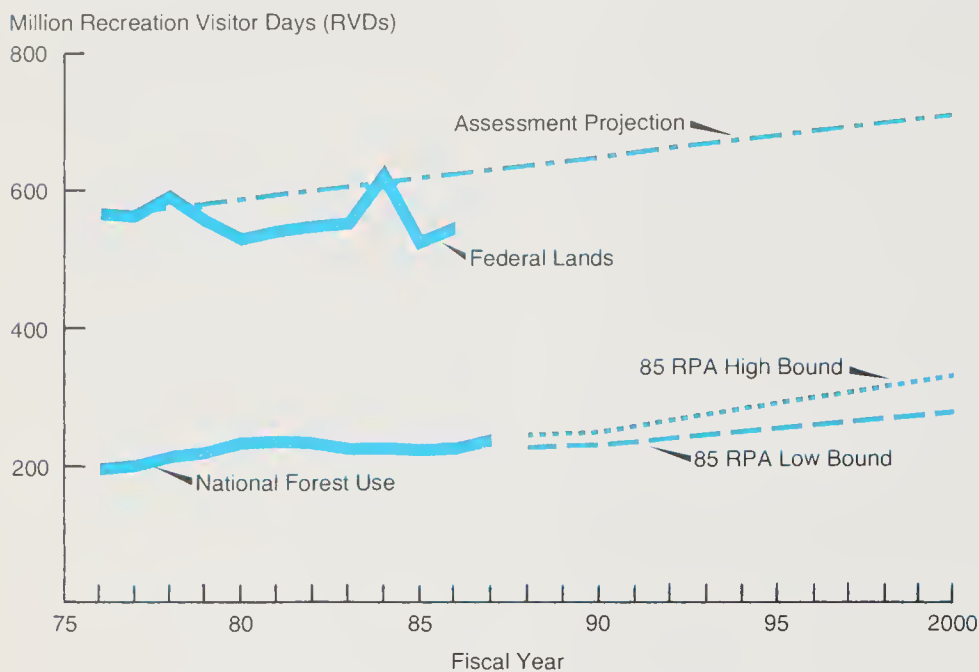
Water Resources. The Recommended Program maintains or enhances national forest long-term water supplies and water quality. Emphasis in the early years is on improved watershed condition and maintaining sensitive riparian areas.

Wildlife and Fish. The Recommended Program provides for balanced attention to all wildlife and fish habitats to meet long-term goals. The High Bound includes special emphasis to improve habitat for threatened and endangered species and salmon and steelhead by the year 2000.

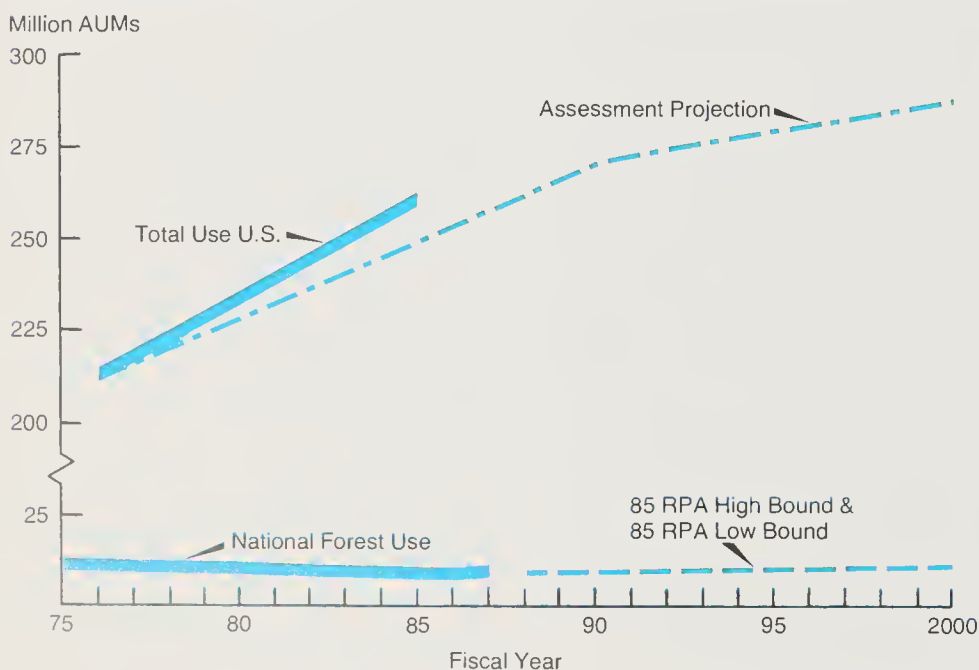
The hunting and fishing graphs show U.S. and national forest totals,

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Recreation Use



Range Grazing



as well as RPA Assessment projections. Total U.S. hunting has decreased since 1980 compared with more optimistic Assessment projections; hunting on national forests has followed a similar downward trend to 1986, but shows a rebound in 1987. Total fishing since 1980 has increased much more rapidly than was anticipated by the Assessment.

However, fishing on national forests has declined slightly. Hunting and fishing on National Forest System lands increase at the High Bound; however, they would remain about constant at the Low Bound. As compared with the Assessment projection, the national forest share of hunting and fishing will decline at both Bounds by 2000.

Other Resource Areas. Although protection and support activities in aviation and fire, land management, and human resource programs meet long-term objectives, they require a high level of risk management to cope with future uncertainty. Rehabilitation and reconstruction of buildings and roads are at low levels until after 1990 at the Low Bound.

Deferred Work. Recreation use on national forests declined from 1981-86, although 1987 returned to the level of the early 80's. About 60 percent of recreation use on national forests is for unstructured dispersed recreation. The remaining use is at developed facilities. Over this period, the operating capacity for these facilities on national forests has declined to the current level of 126 million PAOT-days. The decline in use during the 80's in part reflects this lower capacity and a public preference for higher levels of development at recreation facilities.

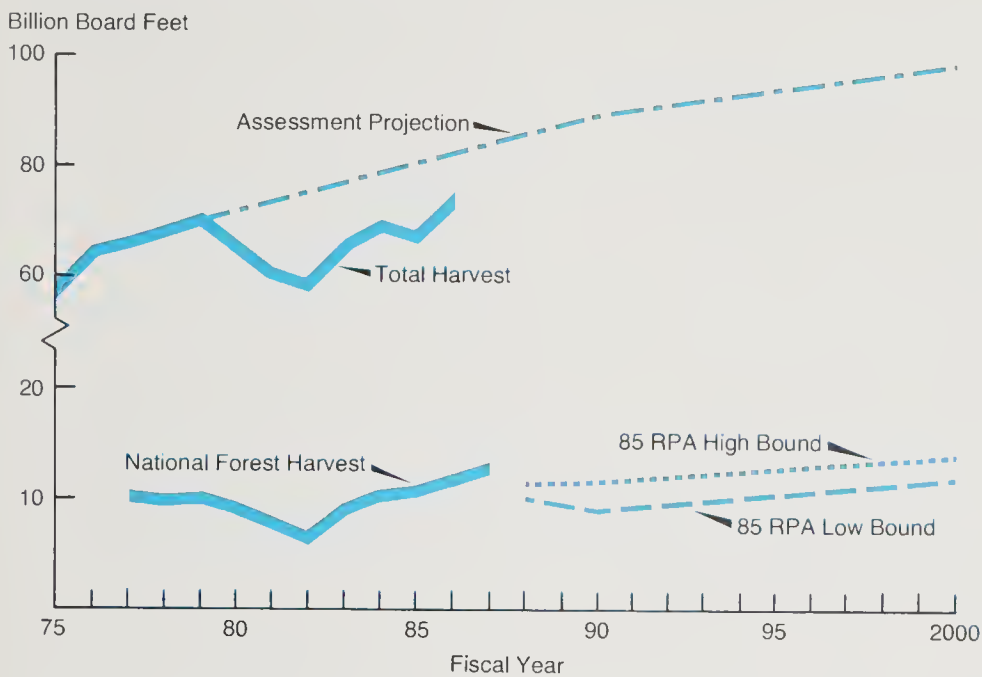
Past maintenance levels have resulted in a substantial amount of facility and resource rehabilitation work that needs to be done. The current condition of recreation facilities and trails is a visible example of this situation. Nevertheless, the amount of deferred recreation facility maintenance has been gradually reduced in recent years.

The High Bound eliminates deferred maintenance in these areas by 2000. At the Low Bound, deferred maintenance rises through 1990. After 1990, the Low Bound of the Program also reduces the inventory of deferred needs to prevent further resource and facility deterioration.

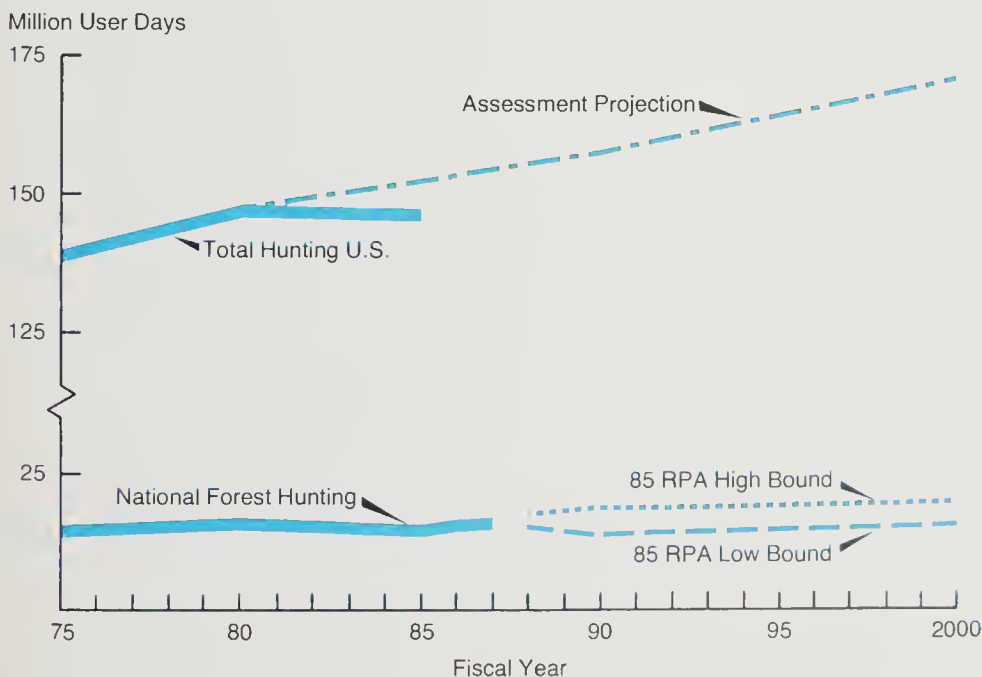
State and Private Forestry

The objective of State and Private Forestry is to increase the productivity of nonindustrial private forest lands to help meet projected resource demands at reasonable prices. Fifty-eight percent of the Nation's commercial forest land is owned by nonindustrial private forest landowners. These lands currently support 42 percent of the Nation's softwood and hardwood growing stock and 33 percent of the Nation's sawtimber inventory. Because there is relatively little forest management on about two-thirds of these lands, they offer the broadest

Timber Demand and Harvest Levels



Hunting



State-level assistance. The High Bound of the Program assumes States will gradually replace Federal financial assistance, and that this will be accomplished by 2000. At the Low Bound, the Program assumes that Federal financial assistance will be discontinued after 1986.

For the fifth consecutive year, the Nation has broken all previous records for planting forest trees on non-industrial private lands. Approximately 43 percent of the trees planted in 1987 (1.3 million acres) were on nonindustrial private forest lands, primarily in the South.

The State and Private Forestry reforestation programs described in the 1985 RPA Program provide assistance in reforestation on nonindustrial private forest lands. In 1982, State-Federal cooperative programs, which include both State and Federal costs, assisted in almost all the 548,000 acres of reforestation on nonindustrial private forest lands—in 1986, they helped reforest 667,000 acres, or 75 percent of the total.

The chart shows this accomplishment compared to the RPA program. The increase from 1981 through 1986 occurred with stable funding of the Forestry Incentives Program (FIP) and the Agricultural Conservation Program (ACP), which provide cost-share assistance to landowners, and reflects a trend of the States and landowners to provide an increasing share of the cost. Although reforestation under ACP and FIP is included in RPA, these programs are funded through the Agricultural Stabilization and Conservation Service, and their costs are not included in the State and Private Forestry costs.

The primary reason for the sharp increase in 1987 planting was the Conservation Reserve Program, established as part of the Food Security Act of 1985. Congress established a goal of 5 million acres for tree planting under this program by 1990. This will result in a large bulge in acres planted, similar to the Soil Bank Program in the late 1950's. After 1990, tree planting accomplishments are expected to drop back to the pre-1987 trend. Including Conservation Reserve Program planting, State-Federal cooperative programs accounted for about 85 percent of total reforestation on nonindustrial private land in 1987.

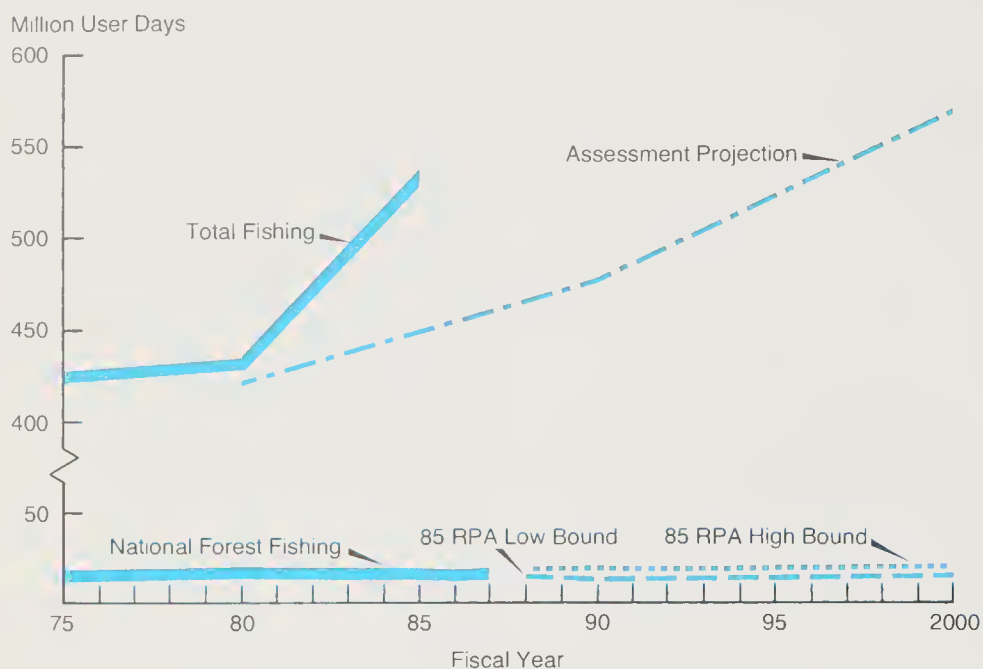
opportunity for increasing timber supplies in this country. These opportunities are located largely on 74 percent of these lands which are held in units larger than 100 acres by 10 percent of the landowners.

The Program relies on the States and the private sector to provide an

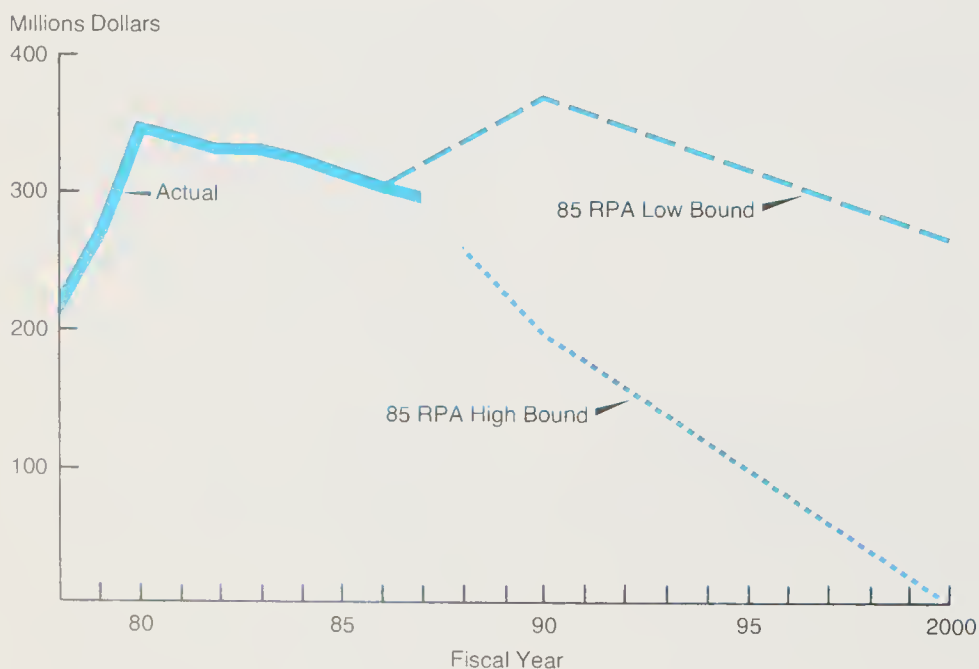
increasing share of the cost over time at both the High and Low Bounds. Expected outputs are the same at both Bounds after 2000, but the Federal presence is different. Both Bounds would require the States to decide whether to replace Federal financial assistance with

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Fishing



Recreation Facilities Deferred Maintenance 1987 Dollars



Research

The research goal is to improve long-term productivity on public and private lands and to provide basic technology to cope with emerging problems. A primary focus of the RPA Program for research is to support cost-efficient management of National Forest System lands. The ability to meet planned national forest output levels is directly related to early investments in research.

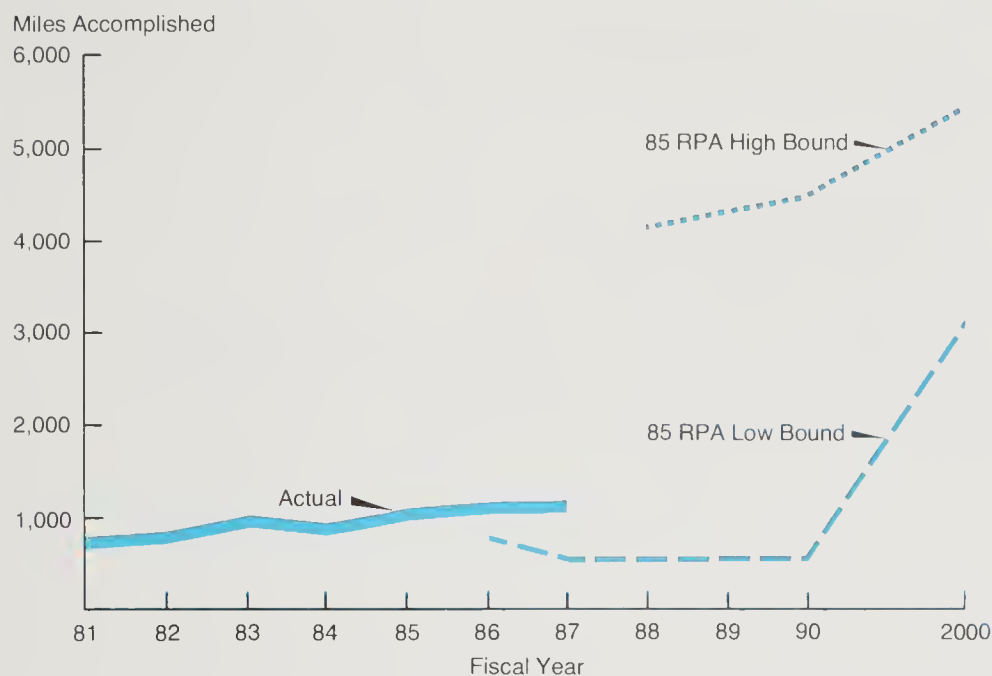
The research program has two major components: (1) the base level, and (2) additional research initiatives. A substantial portion of the base program is aimed at sustaining technological effectiveness. Other research in the base program is classified as enhancing research—research to increase technological capability and effectiveness.

To satisfy the additional technology needs identified for assistance of the Forest Service and other Federal, State, and private sector users of Forest Service research, the Forest Service would need a program above 1986 levels for high-priority initiatives in such areas as biotechnology and acid deposition. The most distinct differences between the High Bound and Low Bound are the rates of implementation of currently identified initiatives and some reordering of priorities among initiatives. At the High Bound, research on most of the initiatives would be underway by 2000; at the Low Bound this level of research will not be reached until 2030.

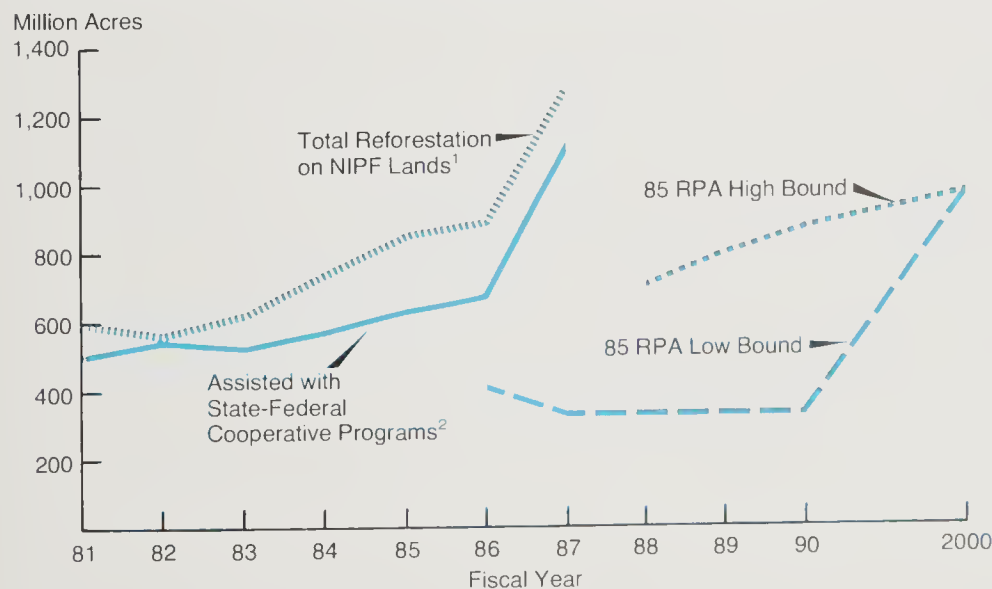
Total Program

The accompanying figure shows the actual Forest Service program levels for 1981-1987 for national forest management and administration, State and Private Forestry assistance and leadership, and Forest Service research. The figure also shows the program levels associated with the first 15 years that would move toward the long-term goals and outputs.

Trail Miles Constructed/Reconstructed RPA and Actual Accomplishments



Total Reforestation on Nonindustrial Private Forest (NIPF) Lands



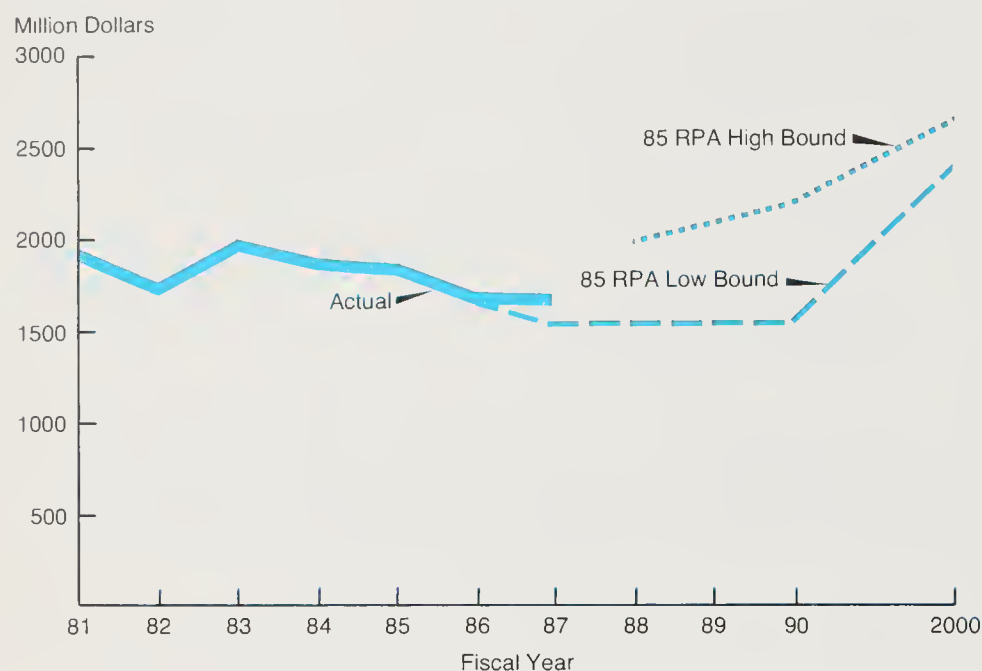
¹Total reforestation on NIPF lands includes acreage from state incentives programs, landowner assistance by industry, consultants, and unassisted owners in addition to acreage assisted with State-Federal cooperative (S&PF) programs. Accomplishment shown for FY 1987 includes Conservation Reserve planting.

²The portion of reforestation assisted by State-Federal cooperative programs—FIP and ACP (ASCS programs jointly administered by the Forest Service) and Conservation Reserve (administered by ASCS with Forest Service and Soil Conservation Service assistance) which cost share planting with landowners; and non-cost share planting, i.e. provide technical assistance only.

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RPA Program

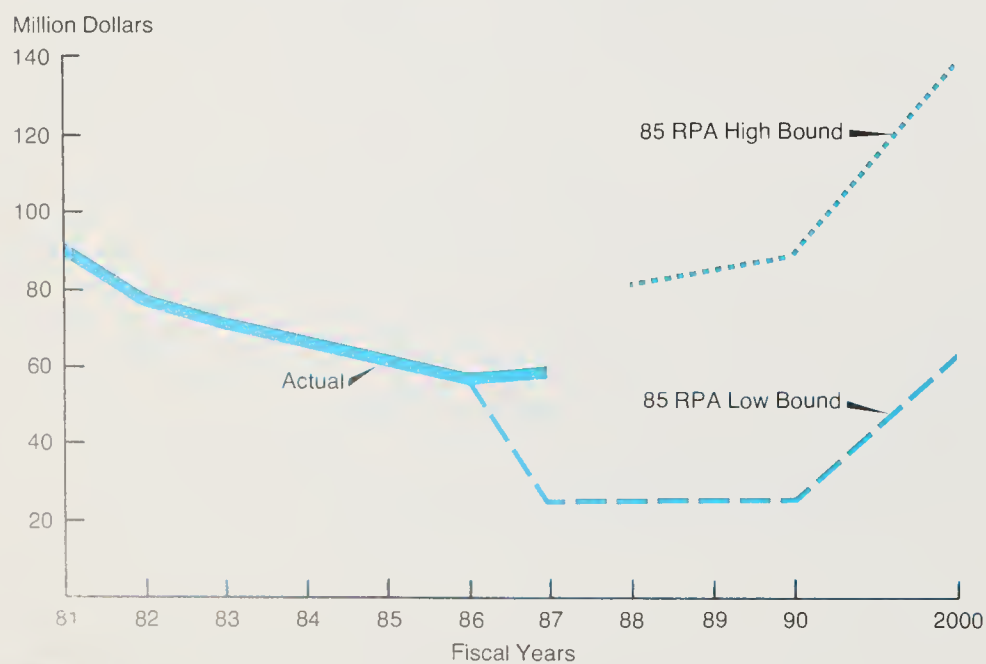
National Forest System 1987 Dollars



Note: The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

RPA Program

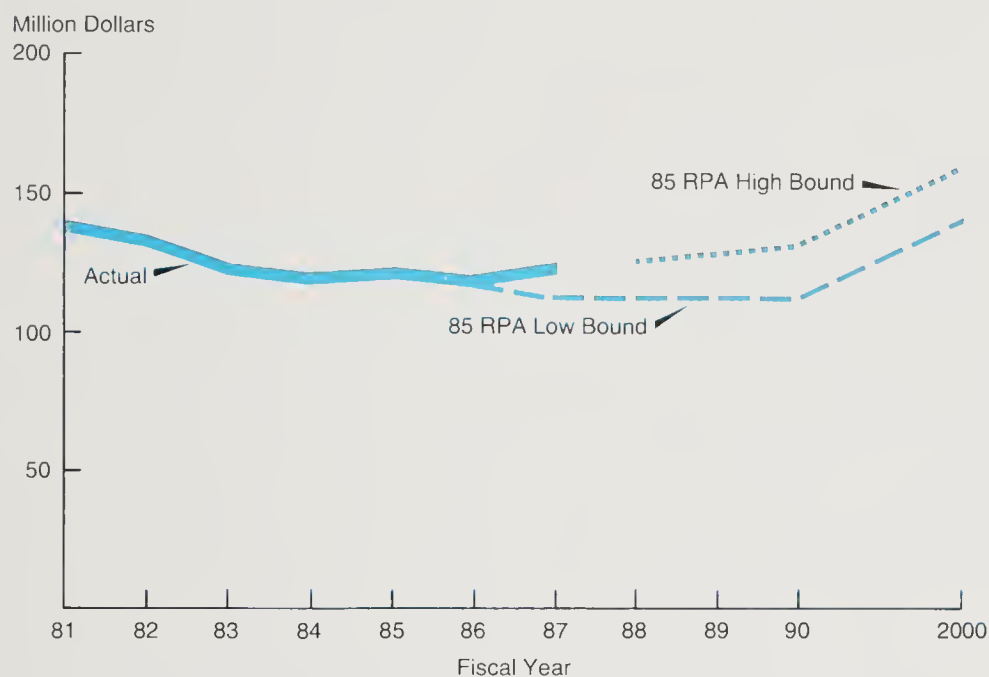
State and Private Forestry 1987 Dollars



Note: The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

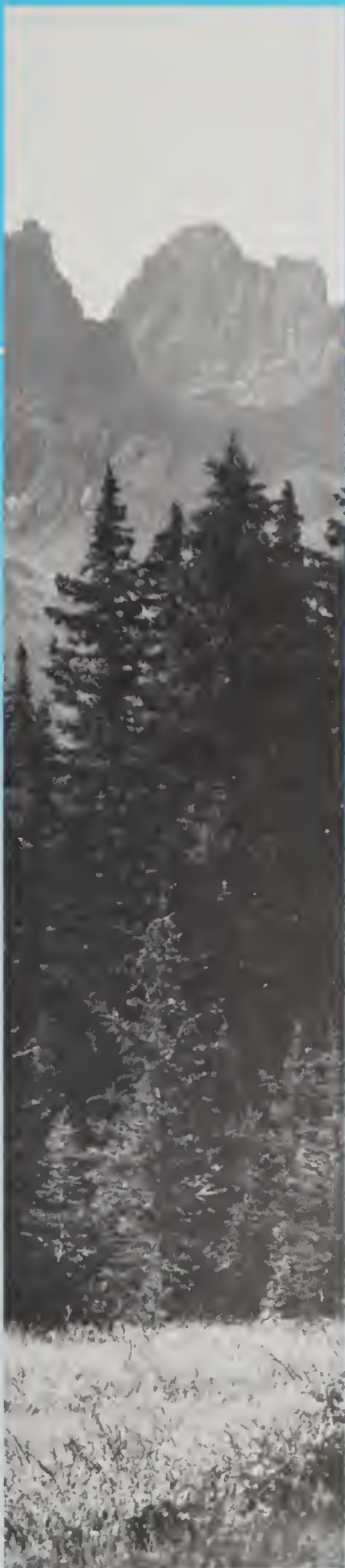
RPA Program

Research
1987 Dollars



Note: The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

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Table 1—Summary of National Forest System accomplishments compared to funded output levels and 5-year average—fiscal year 1987

Resource area	Activity	Units	1987			Percent of funded	1983-87 average accomplishment	as percent of 5-year average
			Funded	Accomplished				
Resource: Recreation Wilderness Wildlife and fish Range Timber	Visitor use	MM RVD's	228.0	238.5		104.6	227.0	100.4
	Management	MM acres	32.5	32.5		100.0	29.3	109.4
	Habitat improvement ^{2/}	M acres	108.3	124.1		114.6	255.6	48.6
	Permitted grazing use	MM AUM's	9.8	9.9		101.0	10.0	99.4
	Sales offering	B board ft	11.2	11.5		102.7	11.6	99.3
	Silvicultural exams	MM acres	4.7	5.2		110.6	5.9	88.4
	Reforestation							
	Appropriated funds	M acres	139.7	133.6 ^{3/}		95.6	166.3	80.3
	K-V funds ^{4/}	M acres	255.6	254.8		99.7	205.7	123.9
	Timber-stand improvement							
Soil and water Minerals	Appropriated funds	M acres	185.8	214.8 ^{3/}		115.6	259.1	82.9
	K-V funds	M acres	182.4	134.3		73.6	118.9	113.0
	Resource improvement ^{5/}	M acres	6.7	10.4		155.2	8.1	127.8
	Leases and permits	Cases	22,952	25,104		109.4	27,574.4	91.0
Support:	Trail construction/reconstruction	Miles	730.0	867.9		118.9	658.2	131.9
	Road construction							
	Appropriated funds	Miles	1,960.0 ^{6/}	2,394.4 ^{7/}		122.2	1,869.1	130.9
	Purchaser credit ^{8/}	Miles	5,709.0	5,482.2		96.0	5,841.7	93.8
	Fuel management ^{9/}	M acres	286.0	345.2		120.7	294.8	117.1
	Land acquired							
	Purchase and donation	M acres	78.2	105.0		134.3	57.3	183.1
	Exchanges	M acres	65.4	134.8		206.1	138.3	97.5
	Landline location	Miles	4,717.0	5,250.2		111.3	5,783.2	90.8

1/ M = thousand, MM = million, B = billion.

2/ Average for 1983-1987 includes 197,394 acres accomplished with Knutson-Vandenberg funds in 1984.

3/ Does not include prior year carryover acres.

4/ K-V = Knutson-Vandenberg Act.

5/ Appropriated funds only.

6/ Does not include 33 miles of Tongass Timber Supply Fund miles.

7/ Does not include 51.8 Tongass Timber Supply Fund miles.

8/ Average for 1983-1987 includes 235 miles turned back to Forest Service in 1987; and a 1983-87 average of 420 miles.

9/ Does not include 1,823 acres accomplished through human resource programs and 352,372 acres with brush disposal funds. The 1931-35 average was 8,315 acres accomplished through human resource programs and 431,156 acres using brush disposal funds.

Report of the Forest Service Fiscal Year 1987

Table 2—National Forest System funding—fiscal year 1987 compared to 1983-87 average

	1987		1983-87 average	Percent of actual to average
	Actual	RPA 1/ 1,000 constant 1987 dollars		
Minerals area management	27,007	26,075	26,835	100.6
Real estate management	20,350	19,845	20,789	97.9
Landline location	26,980	23,011	28,730	93.9
Maintenance of facilities	15,055	14,735	16,690	90.2
Forest fire protection	159,388	147,225	162,155	98.3
Fighting forest fires	125,000	1,000	79,722	156.8
Cooperative law enforcement	6,675	2,450	6,415	104.0
Forest road maintenance	63,073	49,270	68,606	91.9
Forest trail maintenance	11,385	8,365	11,167	102.0
Sales administration and management	189,640	171,092	188,964	100.4
Reforestation and stand improvement <u>2/</u>	90,098	87,948	112,750	79.9
Recreation use	113,287	103,140	107,224	105.7
Wildlife and fish habitat management	42,552	33,780	38,478	110.6
Range management	27,576	27,819	28,531	96.7
Soil and water management	33,981	28,787	32,244	105.4
Subtotal	952,047	744,542	929,300	1,534
General administration (subtotal)	263,121	250,852	269,677	97.6
Youth Conservation Corps <u>3/</u>	-- <u>4/</u>	--	745	
Construction and land acquisition:				
Construction of facilities <u>5/</u>	25,663	11,736	32,049	80.1
Forest road construction	233,310	178,485	231,789	100.7
Forest trail construction	7,579	4,976	6,564	115.5
Forest roads purchaser construction <u>6/</u>	(97,099)	(154,321)	(0)	--
Mt. Elden Work Center	300	0	0	0
Subtotal	266,852	195,197	270,401	296
Highway Construction Mount St. Helens National Monument (subtotal)	9,915	0	0	0

See footnotes at end of table.

Table 2—National Forest System funding—fiscal year 1987 compared to 1983-87 average—Continued

	1987		1983-87 average	Percent of actual to average
	Actual	RPA 1/ 1,000 constant 1987 dollars		
Land acquisition	52,236	--	49,585	105.3
Acquisition of lands for Winema NF	--	--	50	0.0
Acquisition of lands for National Forests, special acts	966	--	834	115.9
Acquisition of lands to complete land exchange	1,573	--	551	241.7
Appropriated trust fund	27	--	54	50.1
Range betterment 7/	3,807	3,800	4,355	87.4
Permanent appropriations	359,643	135,397	432,702	83.1
Trust funds	254,019	197,616	226,849	112.0
Subtotal	672,271	336,813	664,815	796
Total	2,164,206	1,527,404	2,185,213	2,724

1/ Information from 1985-2030 Resources Planning Act-Program. FY 1987 of the RPA Program is based on the President's Budget for FY 1987.

2/ Includes reforestation trust fund dollars.

3/ Funds were provided for unique circumstances and are not included in comparison.

4/ -- = not applicable. These items were not included in the 1985-2030 RPA Program.

5/ Excludes construction of research facilities, which is included in table 51.

6/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.

7/ Range betterment for actual and RPA equals 50 percent of actual grazing receipts.

Table 3—National Forest System funding—fiscal years 1983-87

	1987	1986	1985	1984	1983
			1,000 dollars		
Minerals area management	27,007	27,164	26,572	25,670	22,598
Land management	20,350	19,978	20,836	18,709	19,935
Landline location	26,980	27,399	29,090	29,448	25,034
Maintenance of facilities	15,055	14,124	14,792	14,070	21,710
Forest fire protection	159,388	151,669	156,591	156,734	153,889
Fighting forest fires	125,000	166,652	62,227	35,301	1,000
Cooperative law enforcement	6,675	6,659	7,212	5,175	5,174
Forest road maintenance	63,073	61,856	65,406	64,650	73,666
Forest trail maintenance	11,385	9,537	9,256	9,267	13,988
Sales administration and management	189,640	174,007	194,702	187,547	162,125
Reforestation and stand improvement ^{2/}	90,098	95,433	104,664	85,582	161,963
Recreation use	113,287	99,017	102,057	100,919	99,774
Wildlife and fish habitat management	42,552	37,087	36,726	35,360	33,349
Range management	27,576	26,894	28,170	27,267	27,031
Soil and water management	33,981	30,524	31,808	29,956	28,713
Subtotal	952,047	948,000	890,109	825,655	849,949
General administration (subtotal)	263,121	251,229	258,844	259,865	260,915
Youth Conservation Corps ^{3/}	(0)	(3,234)	(3,234)	(3,500)	3,400
Construction					
Construction of facilities ^{4/}	25,663	26,211	26,228	23,445	51,007
Forest road construction	233,310	180,935	228,914	222,675	245,169
Forest trail construction	7,579	6,866	7,093	5,182	4,936
Forest roads purchaser construction ^{5/}	(97,099)	(91,474)	(192,301)	(240,000)	(240,000)
Chugach Natives, Inc. ^{6/}	(0)	(0)	(0)	(0)	(9,000)
Mt. Elden Work Center	300	0	0	0	0
Subtotal	266,852	214,012	262,235	251,302	301,112
Highway Construction Mount St. Helens National Monument (subtotal)	9,915	0	0	0	0

See footnotes at end of table.

Table 3—National Forest System funding—fiscal years 1983-87—Continued

	1987	1986	1985	1984	1983
	1,000 dollars				
Land acquisition	52,236	31,356	50,535	40,075	63,077
Acquisition of lands for Winema NF	0	0	0	281	0
Acquisition of lands for National Forests, special acts	966	744	766	780	753
Acquisition of lands to complete land exchange	1,573	1,086	42	380	109
Appropriated trust fund	27	12	35	90	90
Range betterment	3,807	3,635	3,966	4,028	5,378
Permanent appropriations	359,643	651,533	393,634	382,154	296,819
Trust funds	254,019	202,517	172,541	231,103	169,937
Total	2,164,206	2,304,124	2,094,791	1,995,713	1,951,539

1/ The Forest Service did not receive a supplemental fire appropriation in 1983. Under a new procedure, actual expenses will be reimbursed the following year.

2/ Includes reforestation trust fund dollars.

3/ Funds provided for unique circumstances and are not included in comparison.

1983 - \$10 million appropriated. Forest Service portion \$3.4 million. 1984 - operated a \$3.5 million program from available funds. 1985 - operated a \$3.2 million program from available funds.

1986 - operated a \$3.5 million program from available funds. 1987 - operated \$3.6 million program from available funds.

4/ Excludes construction of research facilities, which is included in table 51.

5/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.

6/ Unique funding for special purposes.

7/ Includes \$6.2 million transferred from National Park Service.

Table 4—Summary of National Forest System accomplishments compared to RPA projections—fiscal year 1987

Resource area	Activity	Units 1/	1987		
			Accom- plished	Percent of RPA accomplished	RPA recommended level
Final output 2/					
Timber	Sales offering	B board ft	11.5	115.0	10.0
Recreation	Visitor use	MM RVD's	238.5	111.0	215.0
Range	Permitted grazing use	MM AUM's	9.9	101.0	9.8
Minerals	Applications, proposals, and administration	Cases 3/	25.1	100.4	25
Intermediate output 4/					
Timber	Reforestation	M acres	388.4	115.9	335
Wildlife	Timber-stand improvement	M acres	349.0	115.6	302
Wilderness	Habitat improvement	M acres	124.1	42.0	297
Soil and water	Management	MM acres	32.5	92.9	35
Trails	Resource improvement 5/ Construction/ reconstruction/	M acres	10.4	144.0	7.2
Roads	Construction/ reconstruction/	Miles	867.9	173.0	502
Fire	reconstruction	Miles	7,876.4 6/	114.5	6,879 7/
Lands	Fuel management 8/ Purchase and donation	M acres	697	104.0	670
		M acres	105.0	-- 9/	--

1/ M = thousand, MM = million, B = billion; RVD's = recreation visitor-days, AUM's = animal unit months.

2/ Final output = forest and rangeland goods and services purchased or consumed by the private sector or individual consumers.

3/ Reported as operating plans in the 1985-2030 Resources Planning Act-Program.

4/ Intermediate output = work performed by the Forest Service that contributes to the production of final outputs.

5/ Acres accomplished with appropriated funds only.

6/ Includes appropriated and purchaser roads. Does not include 51.8 Tongass Timber Supply Fund miles.

7/ Represents a projection of miles constructed/reconstructed for all roads and is contingent on planned resource outputs.

8/ Does not include acres accomplished through human resource programs.

9/ -- = Not applicable. These items were not reported in the RPA Program.

Table 5—Draft and final forest plan environmental impact statements filed with the Environmental Protection Agency by Region as of September 30, 1987 ^{1/}

Northern Region	Rocky Mountain Region	Southwestern Region	Intermountain Region
<u>Final</u>	<u>Final</u>	<u>Final</u>	<u>Draft</u>
Flathead (MT)	Rio Grande (CO)	Cibola (NM)	Salmon (ID)
Lewis & Clark (MT)	Nebraska (NE)	Tonto (AZ)	Bridger-Teton (WY)
Beaverhead (MT)	Bighorn (WY)	Carson (NM)	***Boise (ID)
Helena (MT)	Arapaho-Roosevelt (CO)	Coronado (AZ)	<u>Final</u>
Lolo (MT)	Grand Mesa, Uncompahgre, and Gunnison (CO)	Gila (NM)	Uinta (UT)
Bitterroot (MT)	Routt (CO)	Lincoln (NM)	Wasatch-Cache (UT)
Custer (MT)	San Juan (CO)	Prescott (AZ)	Targhee (ID)
Deerlodge (MT)	Black Hills (SD)	**Apache-Sitgreaves (AZ)	Caribou (ID)
*Nezperce (ID)	White River (CO)	*Coconino (AZ)	Fishlake (UT)
*Gallatin (MT)	Pike-San Isabel (CO)	*Santa Fe (NM)	Toiyabe (NV)
*Idaho Panhandle (ID)	Medicine Bow (WY)	**Kaibab (AZ)	Dixie (UT)
*Clearwater (ID)	Shoshone (WY)		Humboldt (NV)
*Kootenai (MT)			Payette (ID)
	Alaska Region		*Challis (ID)
	<u>Final</u>		*Ashley (UT)
	Chugach (AK)		*Sawtooth (ID)
			*Manti-LaSal (UT)
Pacific Southwest Region	Pacific Northwest Region	Southern Region	Eastern Region
<u>Draft</u>	<u>Draft</u>	<u>Final</u>	<u>Final</u>
Tahoe (CA)	Deschutes (OR)	Francis Marion (SC)	Hoosier (IN)
Stanislaus (CA)	Okanogan (WA)	Sumter (SC)	Nicolet (WI)
Lake Tahoe Basin Management Unit (CA)	Wallowa-Whitman (OR)	Mississippi (MS)	Superior (MN)
Sequoia (CA)	Wenatchee (WA)	Kisatchie (LA)	Monongahela (WV)
San Bernardino (CA)	Siskiyou (OR)	Chattahoochee-Oconee (GA)	Chippewa (MN)
Lassen (CA)	Ochoco (OR)	Daniel Boone (KY)	Allegheny (PA)
Los Padres (CA)	Olympic (WA)	Jefferson (VA)	Huron-Manistee (MI)
Shasta-Trinity (CA)	Siuslaw (OR)	George Washington (VA)	Chequamegon (WI)
Mendocino (CA)	Umatilla (OR)	Caribbean (PR)	Mark Twain (MO)
Sierra (CA)	Gifford Pinchot (WA)	Cherokee (TN)	Hiawatha (MI)
Eldorado (CA)	***Mt. Hood (OR)	Ozark-St. Francis (AR)	Ottawa (MI)
***Klamath (CA)	Umpqua (OR)	Florida (FL)	White Mountain (NH)
Inyo (CA)	Fremont (OR)	Quachita (AR)	*Green Mountain (VT)
Modoc (CA)	Malheur (OR)	Alabama (AL)	*Shawnee (IL)
Six Rivers (CA)	Rogue River (OR)	Croatan-Uwharrie (NC)	**Wayne (OH)
<u>Final</u>	Colville (WA)	*Nantahala-Pisgah (NC)	
Cleveland (CA)	Mt. Baker (WA)	*Texas (TX)	
*Angeles (CA)	*Winema (OR)		
*Plumas (CA)	*Willamette (OR)		

^{1/} Includes Forest plans filed in previous years.

* Plans filed in 1987.

** Plans completed but not filed by 9/30/87.

*** Plans reviewed by WO, but required additional analyses be done.

**Table 6--Planned and approved minerals cases by Region--
fiscal year 1987**

Region	Cases		
	RPA recommended level 1/	Planned	Accomplished
Northern	6,341	5,879	4,719
Rocky Mountain	3,403	3,157	3,364
Southwestern	1,896	1,758	2,406
Intermountain	3,680	3,412	3,635
Pacific Southwest	1,423	1,319	1,417
Pacific Northwest	2,770	2,569	2,703
Southern	2,279	2,114	3,348
Eastern	2,374	2,202	2,997
Alaska	584	542	515
Total	24,750	22,952	25,104

1/ Information from 1985-2030 Resources Planning Act-Program.

Table 7--Energy mineral workload and production--fiscal years 1983-87

Fiscal year	Acres under lease Millions	Energy- related cases	Energy- related cases in inventory	Oil production Barrels	Gas production 1,000 cubic feet	Coal production Short tons
1983	34.4	15,940	4,400	13,000,000	205,000,000	14,300,000
1984	34.0	13,103	2,805	12,000,000	205,000,000	15,100,000
1985	33.3	15,473	3,533	13,000,000	217,000,000	15,600,000
1986	28.2	14,194	2,363	13,000,000	180,000,000	21,000,000
1987 1/	23.2	14,023	1,571	19,000,000	190,000,000	41,200,000

1/ All figures are estimated.

Table 8—Land acquisition and exchange—fiscal year 1987

	Acres	Cases	Value
			<u>Million dollars</u>
Purchase	104,991	738 <u>1/</u>	45.93
Exchange	134,757	159	112.06
Donation	132	8	0.18
Total	239,880	905	168.17

1/ Includes 640 cases in the Lake Tahoe Basin, CA and NV.

Table 9—Miles of landline location by Region—fiscal year 1987

Region	Total miles boundary	1987 mileage accomplishment	Total miles surveyed
Northern	30,664	451	5,835
Rocky Mountain	51,433	508	4,067
Southwestern	19,991	367	5,711
Intermountain	28,659	328	4,040
Pacific Southwest	29,577	948	9,840
Pacific Northwest	25,627	926	12,583
Southern	42,280	903	34,988
Eastern	42,642	727	7,453
Alaska <u>1/</u>	1,536	92	904
Total	272,409	5,250	85,421

1/ Does not reflect changes due to Alaska Native Claims Settlement Act of 1971 (85 Stat. 688), as amended, and the Alaska Statehood Act of 1958 (72 Stat. 339), as amended. As the land selections are overlapping and/or in a constant state of change, the Region is not keeping track of the boundary changes at this time.

Report of the Forest Service Fiscal Year 1987

Table 10—Lands administered by the Forest Service as of September 30, 1987

State, Commonwealth, or Territory 1/	National Forests, pur- chase units, research areas, and other areas	National Grasslands Acres	Land Utilization Projects	Total
Alabama	649,116	0	40	649,156
Alaska	22,750,439	0	0	22,750,439
Arizona	11,275,763	0	0	11,275,763
Arkansas	2,483,510	0	0	2,483,510
California	20,505,209	0	19,222	20,524,431
Colorado	13,845,745	611,930	440	14,458,115
Connecticut	24	0	0	24
Florida	1,099,762	0	0	1,099,762
Georgia	857,636	0	9,340	866,976
Hawaii	1	0	0	1
Idaho	20,407,655	47,746	0	20,455,401
Illinois	263,363	0	0	263,363
Indiana	187,913	0	26	187,939
Kansas	0	108,177	0	108,177
Kentucky	665,336	0	0	665,336
Louisiana	600,231	0	0	600,231
Maine	52,860	0	260	53,120
Michigan	2,801,170	0	959	2,802,129
Minnesota	2,805,844	0	0	2,805,844
Mississippi	1,147,574	0	0	1,147,574
Missouri	1,459,564	0	13,104	1,472,668
Montana	16,795,864	0	0	16,795,864
Nebraska	257,506	94,332	0	351,838
Nevada	5,103,284	0	0	5,103,284
New Hampshire	714,646	0	0	714,646
New Mexico	9,189,220	136,417	240	9,325,877
New York	13,232	0	0	13,232
North Carolina	1,219,843	0	0	1,219,843
North Dakota	743	1,105,046	0	1,105,789
Ohio	179,213	0	0	179,213
Oklahoma	249,365	46,300	0	295,665
Oregon	15,508,852	111,379	856	15,621,087
Pennsylvania	510,691	0	0	510,691
Puerto Rico	27,846	0	0	27,846
South Carolina	606,139	0	0	606,139
South Dakota	1,134,051	862,847	0	1,996,898
Tennessee	625,890	0	0	625,890
Texas	635,251	117,542	0	752,793
Utah	8,040,065	0	0	8,040,065
Vermont	325,534	0	0	325,534
Virgin Islands	147	0	0	147
Virginia	1,638,414	0	0	1,638,414
Washington	9,143,537	0	738	9,144,275
West Virginia	1,003,470	0	0	1,003,470
Wisconsin	1,507,158	0	0	1,507,158
Wyoming	8,682,549	572,220	0	9,254,769
Total	186,971,225	3,813,936	45,225	190,830,386

1/ States not listed have no lands administered by the Forest Service.

Table 11—Fuels treatment acreage accomplished by appropriation—fiscal year 1987

Region	RPA recommended level	Accomplishment			Total
		Forest fire protection	Volunteer and contri- buted work Acres	Brush disposal funds	
Northern	36,494	13,209	971	48,410	62,590
Rocky Mountain	15,579	5,234	315	11,274	16,823
Southwestern	75,209	46,424	100	56,560	103,084
Intermountain	66,192	13,192	0	28,042	41,234
Pacific Southwest	50,790	27,373	437	48,785	76,595
Pacific Northwest	204,610	27,447	0	156,628	184,075
Southern	213,600	210,722	0	0	210,722
Eastern	7,215	1,561	0	2,633	4,194
Alaska	70	0	0	40	40
Total	669,759	345,162	1,823	352,372	699,357

Table 12—Timber offered, sold, and harvested—fiscal years 1983-87

	1987	1986	1985	1984	1983
Offered: ^{1/}					
Volume (billion board feet)	11.5	11.7	11.5	11.9	11.3
Sold:					
Number of sales	289,043	349,977	366,874	342,964	235,585
Volume (billion board feet)	11.3	11.0	10.8	10.7	11.1
Value (million dollars) ^{2/}	1,003.4	757.0	558.2	698.7	774.4
Harvested:					
Volume	12.7	11.8	10.9	10.5	9.2
Value (million dollars) ^{3/}	1,016.0	786.9	720.6	759.6	649.6

^{1/} This is the number of sales that can be converted to board feet. Not included are 224,751 sales of nonconvertible product in FY 1987.

^{2/} This is the high bid value from all sales sold and includes stumpage, cost of reforestation, stand improvement, and timber salvage. Does not include value of roads or brush disposal.

^{3/} This is the current stumpage rate for the actual volume harvested and includes the reforestation and stand improvement costs and timber salvage. Does not include value of roads or brush disposal.

Table 13—Timber offered, sold, and harvested by Region—fiscal years 1985-87

	1987			1986			1985		
	Offered 1/	Sold 2/	Harvested 3/	Offered 1/	Sold 2/	Harvested 3/	Offered 1/	Sold 2/	Harvested 3/
	Million board feet								
Northern	1,024.1	981.3	1,104.5	1,044.0	914.9	1,024.0	1,043.6	937.9	944.4
Rocky Mountain	400.2	432.6	426.8	403.3	314.1	411.5	488.0	490.3	392.7
Southwestern 4/	407.2	433.2	504.3	440.6	446.9	485.5	438.7	342.8	394.5
Intermountain 4/	414.7	390.2	455.3	431.6	483.7	461.5	432.2	379.7	433.6
Pacific Southwest	1,496.8	1,594.8	2,011.2	1,495.0	1,508.4	1,854.1	1,628.6	1,679.9	1,664.3
Pacific Northwest	5,270.8	5,272.9	5,597.2	5,366.5	5,059.9	4,965.2	4,679.2	4,752.5	4,760.3
Southern	1,302.9	1,268.5	1,424.0	1,366.6	1,295.9	1,560.7	1,551.8	1,412.2	1,382.0
Eastern 4/	747.2	775.6	852.3	735.8	753.1	732.6	840.8	782.0	737.5
Alaska 4/	410.6	169.8	336.4	384.4	189.7	291.4	433.5	41.7	232.0
TOTAL	11,474.4	11,319.0	12,712.1	11,667.8	10,966.6	11,786.5	11,536.4	10,819.0	10,941.3

1/ Sales volume offered for the first time.

2/ Does not include the volume of long-term sales released for harvesting. Includes miscellaneous small sales that were previously offered and/or sold and were reoffered and sold in the fiscal year being displayed.

3/ Includes the volume harvested on long-term sales.

4/ Includes long-term sales volume prepared in the offered column.

5/ Columns do not sum due to rounding.

Table 14—Number of sales, volume, and value of timber sold on National Forest lands by size class—fiscal years 1983-87

	Sale size class								Total less non- convertibles 3/
	To \$300	\$301- \$2,000	\$2,001- 2,000MBF	1/ 5,000MBF	2,001- 5,000MBF	5,001- 15,000MBF	15,001MBF and over	Noncon- vertibles 2/	
1983									
Number of Sales	226,181	5,684	2,499		574	563	84	214,429	235,585
Volume (MBF)	769,628	455,864	1,483,998		1,896,965	4,888,337	1,566,605	0	11,061,397
Value (\$1,000)	5,081.3	9,116.0	97,819.5		132,413.9	421,334.7	108,605.1	1,715.7	774,370.5
1984									
Number of Sales	330,252	8,693	2,834		619	555	53	206,869	343,006
Volume (MBF)	903,189	379,271	1,634,609		2,085,355	4,711,844	947,429	0	10,661,698
Value (\$1,000)	5,599.1	7,262.7	103,076.2		149,605.1	372,807.1	60,368.0	1,581.7	698,718.2
1985									
Number of Sales	348,999	13,563	3,113		562	595	42	225,493	366,874
Volume (MBF)	830,237	589,475	1,698,402		1,868,425	5,063,888	768,564	0	10,818,991
Value (\$1,000)	5,810.1	8,562.2	80,568.9		100,221.6	314,475.0	48,547.3	1,662.7	558,192.1
1986									
Number of Sales	325,646	20,320	2,763		587	606	55	205,132	349,977
Volume (MBF)	851,974	363,324	1,517,092		1,922,224	5,269,466	1,042,497	0	10,966,577
Value (\$1,000)	7,359.1	8,533.7	76,133.3		116,679.4	466,693.2	81,624.3	1,671.4	757,023
1987									
Number of Sales	273,210	11,795	2,684		641	662	51	224,751	289,043
Volume (MBF)	672,064	245,148	1,533,199		2,087,251	5,833,972	947,353	0	11,318,987
Value (\$1,000)	4,615.2	4,550.9	96,869.4		163,158.6	633,067.2	101,128.6	1,885.9	1,003,389.9

1/ MBF = thousand board feet

2/ Non-convertible products include Christmas trees, cones, burls, etc.

3/ May not add due to rounding.

Table 15—Timber sold and harvested, by State—fiscal year 1987

State or Commonwealth 2/	Timber sold			Timber harvested 3/	
	Sales	Volume	Value 4/	Volume	Value 4/
		MBF 5/	actual dollars	MBF 5/	actual dollars
Alabama	345	80,834	5,406,375	90,659	6,410,747
Alaska	82	169,835	3,954,241	336,352	-3,282,129 6/
Arizona	25,510	283,256	16,182,376	354,852	23,048,289
Arkansas	3,087	240,300	16,062,193	267,940	15,320,468
California	56,782	1,602,577	176,113,120	2,022,027	200,530,477
Colorado	22,281	198,296	2,116,092	179,184	1,553,512
Florida	146	119,976	6,710,764	116,909	7,814,260
Georgia	367	52,851	2,707,105	70,800	3,597,446
Idaho	27,260	702,327	32,701,303	775,048	29,648,005
Illinois	52	13,747	575,481	17,848	558,324
Indiana	86	1,061	14,218	4,881	346,114
Kentucky	920	41,019	1,287,683	43,965	985,009
Louisiana	983	136,247	10,556,415	166,623	12,996,791
Maine	4	508	21,473	5,096	98,034
Michigan	1,012	219,393	4,525,825	213,028	4,168,139
Minnesota	350	152,426	1,516,536	179,976	2,132,235
Mississippi	896	194,369	16,455,804	208,951	18,215,706
Missouri	2,613	73,037	2,763,783	85,449	3,190,815
Montana	17,532	516,773	18,159,073	624,348	18,857,880
Nebraska	61	2,618	9,888	1,189	11,432
Nevada	2,925	2,051	31,587	2,309	32,938
New Hampshire	59	27,693	913,417	31,601	851,431
New Mexico	21,894	149,964	2,959,824	149,482	3,594,718
New York	23	82	1,620	384	28,066
North Carolina	445	58,570	1,657,036	65,417	1,680,961
North Dakota	86	60	1,170	60	1,170
Ohio	130	7,636	401,018	9,951	448,849
Oklahoma	127	36,142	1,860,343	39,643	2,605,227
Oregon	45,560	3,887,130	507,455,718	4,156,091	499,926,329
Pennsylvania	149	76,480	10,063,690	93,703	10,126,456
South Carolina	539	101,960	8,243,666	133,416	11,270,466
South Dakota	2,529	127,814	4,734,387	129,855	2,706,715
Tennessee	203	22,694	1,104,672	34,401	1,265,491
Texas	522	131,237	11,039,350	123,759	14,094,147
Utah	17,522	92,598	1,672,381	96,179	1,654,077
Vermont	66	13,285	460,281	9,209	237,312
Virginia	846	52,344	1,000,402	55,253	876,213
Washington	24,200	1,413,054	125,688,914	1,448,527	111,734,139
West Virginia	491	31,295	1,039,656	42,321	1,619,076
Wisconsin	190	158,949	2,111,685	165,172	2,540,363
Wyoming	10,118	126,498	3,109,220	160,245	2,499,327
Total 7/	289,043	11,318,987	1,003,389,792	12,712,103	1,015,995,025

1/ Excludes nonconvertible products such as Christmas trees, cones, burls, etc.

2/ States not listed had no timber sold or harvested in fiscal year 1986.

3/ Preliminary.

4/ Includes Knutson-Vandenberg and salvage sale receipts. Does not include brush disposal and road costs.

5/ MBF = thousand board feet.

6/ The timber sale harvest values for Alaska include repayments as a result of rate redetermination for short-term sales due to the Federal Timber Contract Payment Modification Act of 1984.

7/ Columns may not add due to rounding.

Table 16—Values, costs, and associated outputs for the fiscal year 1987 timber-sale program

This table reserved for future use. Information for this table will be provided by the Timber-Sale Program Information Reporting System (TSPIRS) when it is fully implemented. See the timber program narrative section for a more complete discussion of TSPIRS.

Table 17—Uncut timber volume under contract by Region—fiscal years 1983-87

Region	1987	1986	1985	1984	1983
Million board feet ^{1/}					
Northern	2,618	3,274	3,812	3,986	3,845
Rocky Mountain	1,154	1,208	1,361	1,227	1,130
Southwestern	936	1,088	1,228	1,125	1,320
Intermountain	772	848	896	1,004	949
Pacific Southwest	3,943	4,456	7,261	6,975	7,278
Pacific Northwest	11,241	10,308	18,263	18,336	18,695
Southern	1,948	2,186	2,785	2,870	2,296
Eastern	1,820	2,054	2,034	1,909	1,802
Alaska	676	562	509	460	456
Total	25,108	25,984 ^{2/}	38,149	37,892	37,771

^{1/} Volume in local scale. Long-term sales not included. Long-term sales volume under contract at the end of fiscal year 1984 was 6,671 million board feet and 7,112 million board feet in 1985.

^{2/} This volume under contract has been reduced by 9,748 million board feet as a result of the Federal Timber Contract Payment Modification Act of 1984.

Table 18—Timber funding—fiscal years 1985-87

	1987	1986	1985
	<u>1,000 dollars</u>		
National Forest System			
Timber management	137,463	120,931	140,432
Harvest administration	52,177	53,076	54,270
Subtotal	189,640	174,007	194,702
Support to timber sales program			
Mineral	1,521	1,126	1,195
Forest Fire Protection	4,522	3,396	4,989
Recreation	8,380	7,698	7,237
Wildlife and Fish	7,020	8,381	8,187
Range	797	933	800
Soil and Water	7,666	7,531	8,845
Subtotal	29,906	29,065	31,253
Road construction			
Forest Service construction	185,400	151,577	200,915
Purchaser construction	(97,099)	(91,474)	(107,887)
Purchaser construction by the Forest Service	5,467	6,218	9,103
Subtotal	190,867	157,795	210,018
Total, appropriated accounts	410,413	360,867	435,973
Special accounts <u>1/</u>			
Timber salvage sales	26,000	20,677	16,055
Tongass timber supply fund	42,254	45,793	47,138
Subtotal	68,254	66,470	63,193
Total <u>2/</u>	478,667	427,337	499,166

1/ Includes General Administration expenses.

2/ Includes Oregon and California (O&C) Grant Land Funding.

Table 19--Reforestation funding and accomplishments by funding source--fiscal years 1983-87

	Appropriated	Knutson-Vandenberg	Total
1983			
Million dollars <u>1/</u>	82.0 <u>2/</u>	73.3	155.3
1,000 acres	193.2 <u>2/</u>	168.5	361.7
Constant dollars/acre	424.4	435.0	429.4
1984			
Million dollars <u>1/</u>	47.2	73.3	120.5
1,000 acres	130.7 <u>3/</u>	195.3	376.0
Constant dollars/acre	261.4	375.3	320.6
1985			
Million dollars <u>1/</u>	59.0	72.7	131.7
1,000 acres	175.2	194.6	369.8
Constant dollars/acre	336.5	373.7	356.1
1986			
Million dollars <u>1/</u>	51.6	67.1	118.7
1,000 acres	148.9	215.1	364.0
Constant dollars/acre	346.3	312.0	326.1
1987			
Million dollars <u>1/</u>	47.9	91.5	139.4
1,000 acres	139.4	254.8	394.2
Constant dollars/acre	343.3	359.1	353.3

1/ All dollars are constant 1987. No general administration funds included. Does not include funds for nursery and tree improvement.

2/ Does not include 65,500 acres of site preparation for planting in fiscal year 1984, as well as 14,500 acres of site preparation for natural regeneration accomplished with \$15 million of Federal Emergency Jobs Program funds, P.L. 98-8.

3/ Increased accomplishments and reduced costs were due to the 65,500 acres of advanced site preparation work as a result of the Federal Emergency Jobs Program in fiscal year 1983.

Table 20—Reforestation program needs—fiscal years 1987-89

	Current or anticipated <u>1,000 acres</u>	Annual program appropriated funds 1/ <u>1,000 acres</u> <u>Million dollars</u>	
10/1/86 balance	848		
Fiscal year 1987:			
New needs <u>2/</u>	+645		
Accomplishments	-394	139.4	47.9
10/1/87 balance	1,099		
Fiscal year 1988:			
New needs <u>2/</u>	+500		
Projected accomplishments	-400 <u>3/</u>	85.0	30.3
10/1/88 balance	1,199		
Fiscal year 1989:			
New needs <u>2/</u>	+500		
Projected accomplishments	-462 <u>3/</u>	134.3	44.5
10/1/89 balance	1,237		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.

2/ New needs are the results of timber harvests, regeneration failures, and natural disasters such as fires, storms, insects, diseases, and other changes. Fiscal Year 1987 had record levels of new needs created by timber harvests, wildfire, and insect epidemics.

3/ Beginning in FY 1988, natural regeneration without site preparation is included in the accomplishment projections.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class

State, Commonwealth, or Territory <u>1/</u> National Forest	Acres by site productivity class <u>2/</u>				Total acres
	20-49	50-84	85-119	120+	
Alabama					
Alabama	0	1,996	4,582	813	7,391
Alaska					
Chugach	91	20	0	0	111
Tongass-Chatham	0	1,835	538	995	3,368
Tongass-Ketchikan	0	0	0	12,148	12,148
Tongass-Stikine	0	57	254	3,390	3,701
Subtotal	91	1,912	792	16,533	19,328
Arizona					
Apache-Sitgreaves	0	53	40	0	93
Coconino	45	1,494	80	0	1,619
Kaibab	522	2,006	0	0	2,528
Tonto	16	435	0	0	451
Subtotal	583	3,988	120	0	4,691
Arkansas					
Ouachita	445	24,326	5,014	10	29,795
Ozark and St. Francis	0	4,783	1,196	0	5,979
Subtotal	445	29,109	6,210	10	35,774
California					
Angeles	0	417	0	0	417
Cleveland	327	0	0	0	327
Eldorado	0	0	5,784	1,498	7,282
Inyo	247	944	0	0	1,191
Klamath	4,711	13,704	16,704	7,280	42,399
Lassen	0	6,648	2,449	1,200	10,297
Los Padres	50	400	131	0	581
Mendocino	4,779	20,721	7,078	3,425	36,003
Modoc	0	3,266	1,590	140	4,996
Plumas	0	3,364	2,036	1,424	6,824
Rogue River	0	0	368	0	368
San Bernardino	273	815	85	0	1,173
Sequoia	289	6,723	2,828	1,639	11,479
Shasta-Trinity	116	5,256	10,014	5,621	21,007

See footnotes at end of table.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	20-49	50-84	85-119	120+	
Sierra	22	3,526	3,167	2,252	8,967
Siskiyou	0	0	511	0	511
Six Rivers	0	88	4,007	3,052	7,147
Stanislaus	321	4,776	33,025	6,331	44,453
Tahoe	1,153	4,054	3,107	7,156	15,470
Toiyabe	1,258	267	0	0	1,525
Subtotal	13,546	74,969	92,884	41,018	222,417
Colorado					
Arapaho and Roosevelt	4,628	2,286	0	0	6,914
Grand Mesa, Uncompahgre, and Gunnison	538	689	200	0	1,427
Pike and San Isabel	4,523	1,424	0	0	5,947
Routt	3,674	1,500	0	0	5,174
San Juan	4,856	9,294	0	0	14,150
White River	35	282	35	0	352
Subtotal	18,254	15,475	235	0	33,964
Florida					
Florida	15,353	10,993	3,193	144	29,683
Georgia					
Chattahoochee and Oconee	0	2,162	4,560	935	7,657
Idaho					
Boise	910	3,557	2,403	1,335	8,205
Caribou	0	409	85	0	494
Challis	199	326	3	0	528
Clearwater	5,522	204	2,067	6,838	14,631
Idaho Panhandle	11,469	1,693	7,829	7,278	28,269
Kootenai	0	1	189	0	190
Nezperce	6,508	1,228	3,100	1,525	12,361
Payette	349	2,215	2,796	0	5,360
Salmon	2,461	2,447	0	0	4,908
Sawtooth	500	205	0	0	805
Targhee	0	6,262	0	0	6,262
Subtotal	28,018	18,547	18,472	16,976	82,013

See footnotes at end of table.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	20-49	50-84	85-119	120+	
Illinois Shawnee	0	1,370	150	0	1,520
Indiana Hoosier	0	0	1,417	607	2,024
Kentucky Daniel Boone	260	1,124	5,625	102	7,111
Louisiana Kisatchie	0	906	5,850	12,074	18,830
Maine White Mountain	162	175	66	12	415
Michigan Hiawatha	1,590	1,987	278	119	3,974
Huron-Manistee	4,691	3,457	82	0	8,230
Ottawa	280	2,815	415	0	3,510
Subtotal	6,561	8,259	775	119	15,714
Minnesota Chippewa	32	430	100	0	562
Superior	736	5,089	736	134	6,695
Subtotal	768	5,519	836	134	7,257
Mississippi Mississippi	155	2,114	7,681	11,361	21,311
Missouri Mark Twain	6,381	10,655	81	0	17,117
Montana Beaverhead	4,195	3,218	32	0	7,445
Bitterroot	4,433	1,875	1,775	203	8,286
Custer	364	143	37	3	547
Deerlodge	3,463	257	764	57	4,541
Flathead	9,657	1,989	5,299	878	17,823
Gallatin	1,648	2,540	66	16	4,270
Helena	5,214	718	500	28	6,460
Idaho Panhandle	0	0	17	0	17
Kootenai	9,742	5,111	16,107	1,599	32,559
Lewis and Clark	1,322	1,114	615	4	3,055
Lolo	2,536	4,758	2,420	308	10,022
Subtotal	42,574	21,723	27,632	3,096	95,025

See footnotes at end of table.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	20-49	50-84	85-119	120+	
New Hampshire					
White Mountain	513	551	211	40	1,315
New Mexico					
Carson	2,651	5,648	0	0	8,299
Cibola	320	1,121	0	0	1,441
Gila	917	1,095	0	0	2,012
Lincoln	0	213	0	0	213
Santa Fe	695	6,238	2,297	0	9,230
Subtotal	4,583	14,315	2,297	0	21,195
New York					
Green Mountain	0	25	75	0	100
North Carolina					
North Carolina	215	3,556	2,501	2,637	8,909
Ohio					
Wayne	0	445	1,191	1,417	3,053
Oklahoma					
Ouachita	0	1,569	254	1,368	3,191
Oregon					
Deschutes	4,087	10,323	3,715	406	18,531
Fremont	3,968	5,154	2,167	51	11,340
Malheur	1,283	5,784	0	0	7,067
Mt. Hood	41	15,725	13,476	2,244	31,486
Ochoco	2,053	1,977	36	0	4,066
Rogue River	0	382	11,192	176	11,750
Siskiyou	0	651	5,025	2,959	8,635
Siuslaw	0	0	0	6,448	6,448
Umatilla	959	4,918	297	0	6,174
Umpqua	0	654	9,812	2,921	13,387
Wallowa-Whitman	4,908	15,330	7,551	0	27,789
Willamette	0	613	15,781	12,853	29,247
Winema	4,913	2,082	1,831	2,213	11,039
Subtotal	22,212	63,593	70,883	30,271	186,959
Pennsylvania					
Allegheny	3,816	4,059	0	0	7,875

See footnotes at end of table.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	20-49	50-84	85-119	120+	
South Carolina					
South Carolina	0	680	2,987	3,121	6,788
South Dakota					
Black Hills	29,925	0	0	0	29,925
Tennessee					
Cherokee	22	718	478	598	1,816
Texas					
Texas	0	5,455	15,002	6,819	27,276
Utah					
Ashley	49,186	21,181	0	0	70,367
Dixie	795	1,251	0	0	2,046
Fishlake	0	305	0	0	305
Manti-LaSal	0	314	0	0	314
Uinta	0	0	568	0	568
Wasatch	549	441	0	0	990
Subtotal	50,530	23,492	568	0	74,590
Vermont					
Green Mountain	155	630	400	0	1,185
Virginia					
George Washington	862	313	123	732	2,030
Jefferson	425	1,522	0	664	2,611
Subtotal	1,287	1,835	123	1,396	4,641
Washington					
Colville	216	3,100	3,608	0	6,924
Gifford Pinchot	23	7,065	4,365	3,119	14,572
Idaho Panhandle	1,160	25	742	571	2,498
Mt. Baker-Snoqualmie	0	627	5,639	2,282	8,548
Okanogan	5,525	3,030	0	0	8,555
Olympic	0	887	6,204	2,884	9,975
Umatilla	0	733	0	0	733
Wenatchee	579	2,428	5,130	1,256	9,393
Subtotal	7,503	17,895	25,688	10,112	61,198

See footnotes at end of table.

Table 21—Reforestation needs as of October 1, 1987, by State, Forest, and site productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	20-49	50-84	85-119	120+	
West Virginia					
George Washington	109	25	100	202	436
Monongahela	0	22	142	32	196
Subtotal	109	47	242	234	632
Wisconsin					
Chequamegon	101	4,530	259	0	4,890
Nicolet	511	2,514	629	275	3,929
Subtotal	612	7,044	888	275	8,819
Wyoming					
Bighorn	2,091	437	0	0	2,528
Blackhills	2,202	0	0	0	2,202
Bridger-Teton	0	616	2,757	0	3,373
Medicine Bow	8,723	2,276	3	0	11,002
Shoshone	1,355	0	0	0	1,355
Targhee	0	207	0	0	207
Subtotal	14,371	3,536	2,760	0	20,667
Total	269,004	360,441	307,709	162,222	1,099,376

1/ States not listed had no reforestation needs as of October 1, 1987.

2/ Site productivity class refers to the amount of wood produced in cubic feet per acre per year in a natural unmanaged stand.

Table 22—Timber-stand improvement funding and accomplishments by funding source—fiscal years 1983-87

	Appropriated	Knutson-Vandenberg	Total
1983			
Million dollars <u>1/</u>	37.4 <u>2/</u>	22.5	59.9
1,000 acres	270.6 <u>2/</u>	127.0	397.6
Constant dollars/acre	138.2	176.8	150.7
1984			
Million dollars <u>1/</u>	27.8	23.3	49.3
1,000 acres	250.1	111.5	361.6
Constant dollars/acre	111.0	209.0	136.4
1985			
Million dollars <u>1/</u>	34.5	19.8	54.3
1,000 acres	300.5	120.9	421.4
Constant dollars/acre	114.9	164.0	128.9
1986			
Million dollars <u>1/</u>	29.0	18.8	47.8
1,000 acres	259.4	100.7	360.1
Constant dollars/acre	111.9	186.2	132.7
1987			
Million dollars <u>1/</u>	27.3	28.1	55.4
1,000 acres	222.7 <u>3/</u>	134.2	356.9 <u>3/</u>
Constant dollars/acre	137.9 <u>3/</u>	144.2 <u>4/</u>	140.4 <u>3/ 4/</u>

1/ All dollars are constant 1987. No general administration included. Does not include funds for nursery and tree improvement.

2/ Does not include 158,000 acres of timber-stand improvement accomplished with \$20 million of Federal Emergency Jobs Program funding, P.L. 98-8.

3/ Accomplishments and costs include the 3.4 million dollars and 8,431 acres done with Tongass Timber Funds.

4/ Although 28.1 million dollars had been authorized, only 19.4 million dollars were obligated and the cost/acres is based upon the obligated amount. The unspent funds return to the K-V trust fund pool for future obligation.

Table 23—Timber-stand improvement program needs—fiscal years 1987-89

	Work needs 1,000 acres	Annual program, appropriated funds 1/ 1,000 Million acres dollars	
10/1/86 balance	1,418		
Fiscal year 1987:			
New needs	+170		
Accomplishments	-357	186	27.3
10/1/87 balance	1,231		
Fiscal year 1988:			
New needs	+350		
Projected accomplishments	-322	134	24.6
10/1/88 balance	1,259		
Fiscal year 1989:			
New needs	+350		
Projected accomplishments	-367	177	30.3
10/1/89 balance	1,242 <u>2/</u>		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451,
as amended.

2/ This represents over 3 years of future accomplishments.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+				Total Acres	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+					
Alabama									
Alabama	0	2,481	1,850	181	4,512	4,512	0	0	0
Alaska									
Chugach	0	54	658	0	712	686	26	0	0
Tongass-Chatham	0	0	861	2,360	3,221	1,812	1,409	0	0
Tongass-Ketchikan	0	0	0	38,888	38,888	1,138	37,750	0	0
Tongass-Stikine	30	10	45	5,279	5,364	0	5,364	0	0
Subtotal	30	64	1,564	46,527	48,185	3,636	44,549	0	0
Arizona									
Apache-Sitgreaves	800	3,610	581	0	4,991	0	4,991	0	0
Coconino	0	10,605	0	0	10,605	0	10,605	0	0
Kaibab	1,140	12,890	0	0	14,030	0	14,030	0	0
Tonto	3,195	5,800	0	0	8,995	1,346	7,649	0	0
Subtotal	5,135	32,905	581	0	38,621	1,346	37,275	0	0
Arkansas									
Ouachita	1,043	17,244	4,721	72	23,080	15,380	7,700	0	0
Ozark and St. Francis	0	5,308	1,327	0	6,635	5,047	1,588	0	0
Subtotal	1,043	22,552	6,048	72	29,715	20,427	9,288	0	0
California									
Angeles	0	888	0	0	888	372	491	25	0
Cleveland	350	1,664	0	0	2,014	99	1,915	0	0
Eldorado	0	0	6,643	1,108	7,751	6,363	1,165	223	0
Inyo	0	1,521	0	0	1,521	46	1,475	0	0
Klamath	3,653	18,970	24,853	8,280	55,756	32,037	23,719	0	0
Lassen	0	3,333	2,778	1,115	7,226	1,696	5,530	0	0
Los Padres	185	1,029	175	0	1,389	462	927	0	0
Mendocino	213	6,305	4,493	606	11,617	8,921	2,276	420	0
Modoc	920	12,170	8,771	1,094	22,955	13,801	8,361	793	0
Plumas	1,964	18,944	10,315	5,485	36,708	20,740	14,913	1,055	0

See footnotes at end of table.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+					Acres		Total subtotal	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+								
San Bernardino	967	3,015	413	0			4,395	1,173	3,222		0	0
Sequoia	138	3,612	4,578	1,389			9,717	6,094	2,951		672	0
Shasta-Trinity	0	11,165	16,336	15,057			42,558	38,700	3,727		131	0
Sierra	0	4,590	3,367	1,660			9,617	6,064	3,553		0	0
Siskiyou	0	0	449	0			449	449	0		0	0
Six Rivers	0	791	23,078	20,990			44,859	38,405	5,304		1,150	0
Stanislaus	151	2,652	4,757	1,665			9,225	7,185	2,040		0	0
Tahoe	6,518	6,920	6,355	18,663			38,456	27,740	10,716		0	0
Toiyabe	2,956	2,432	0	0			5,388	2,462	2,926		0	0
Subtotal	18,015	100,001	117,361	77,112			312,489	212,809	95,211		4,469	0
Colorado												
Arapaho and Roosevelt	7,670	4,331	0	0			12,001	2,600	9,401		0	0
Grand Mesa, Uncompahgre, and Gunnison	2,011	6,838	2,713	0			11,562	8,466	3,096		0	0
Manti-Lasal	0	95	0	0			95	0	95		0	0
Pike and San Isabel	1,413	473	0	0			1,886	1,333	553		0	0
Rio Grande	3,011	19,787	3,375	0			26,173	15,576	10,597		0	0
Routt	2,684	2,474	0	0			5,158	1,323	3,835		0	0
San Juan	0	5,168	0	0			5,168	5,168	0		0	0
White River	715	2,146	716	0			3,577	2,909	668		0	0
Subtotal	17,504	41,312	6,804	0			65,620	37,375	28,245		0	0
Florida												
Florida	0	6,286	2,909	221			9,416	1,500	200		7,716	0
Georgia												
Chattahoochee and Oconee	0	2,759	5,135	1,423			9,317	5,410	3,907		0	0
Idaho												
Boise	625	2,658	7,064	219			10,566	3,366	7,200		0	0
Caribou	0	1,475	263	0			1,738	1,255	483		0	0
Challis	374	1,240	0	0			1,614	370	1,244		0	0
Clearwater	2,218	22	1,202	4,953			8,395	1,702	6,693		0	0

See footnotes at end of table.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+					Total Acres	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+						
Idaho Panhandle Kootenai Nezperce Payette Salmon Sawtooth Targhee	5,981 116 2,353 358 920 414 0	2,930 0 1,165 3,059 962 0 1,760	11,194 407 1,857 3,478 0 0 0	9,462 243 310 260 0 0 0	29,567 766 5,685 7,155 1,882 414 1,760	7,854 116 1,557 1,285 843 128 375	21,713 650 4,128 5,870 1,039 286 1,385	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
Subtotal	13,359	15,271	25,465	15,447	69,542	18,851	50,691	0	0	0
Illinois Shawnee	0	394	42	0	436	350	0	0	86	
Indiana Hoosier	0	0	1,527	6,104	7,631	4,218	1,385	0	2,028	
Kentucky Daniel Boone	53	1,526	6,716	261	8,556	2,895	5,593	3	65	
Louisiana Kitsatchie	0	186	1,227	2,691	4,104	2,938	1,166	0	0	
Maine White Mountain	100	124	36	9	269	225	44	0	0	
Michigan Hiawatha Huron-Manistee Ottawa	396 2,528 0	5,871 5,373 776	2,013 824 349	0 0 0	8,280 8,725 1,125	1,766 5,992 1,125	963 2,733 0	0 0 0	5,551 0 0	
Subtotal	2,924	12,020	3,186	0	18,130	8,883	3,696	0	5,551	
Minnesota Chippewa Superior	0 452	2,602 3,127	800 452	0 82	3,402 4,113	3,102 4,113	0 0	0 0	300 0	
Subtotal	452	5,729	1,252	82	7,515	7,215	0	0	300	

See footnotes at end of table.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+					Total Acres	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+						
Mississippi	0	1,900	2,123	2,605	6,628	5,002	1,041	585	0	0
Mississippi	0	7,998	126	0	8,124	3,724	4,251	0	149	149
Missouri										
Mark Twain										
Montana										
Beaverhead	1,887	1,205	372	38	3,502	938	2,564	0	0	0
Bitterroot	4,087	483	1,485	100	6,155	2,135	4,020	0	0	0
Custer	1,869	139	158	0	2,166	939	1,227	0	0	0
Deerlodge	4,810	1,499	205	0	6,514	2,909	3,605	0	0	0
Flathead	1,310	2,517	9,157	1,485	14,469	919	13,532	18	0	0
Gallatin	300	1,455	118	119	1,992	73	1,919	0	0	0
Helena	528	530	498	20	1,576	495	1,081	0	0	0
Idaho Panhandle	0	14	173	15	202	91	111	0	0	0
Kootenai	2,790	4,087	14,358	6,379	27,614	1,281	26,333	0	0	0
Lewis and Clark	1,403	697	381	0	2,481	965	1,516	0	0	0
Lolo	1,071	2,293	1,501	484	5,349	164	5,178	7	0	0
Subtotal	20,055	14,919	28,406	8,640	72,020	10,909	61,086	25	0	0
Nebraska										
Nebraska	50	85	0	0	135	0	135	0	0	0
New Hampshire										
White Mountain	263	396	163	29	851	705	146	0	0	0
New Mexico										
Carson	8,241	10,578	300	0	19,119	727	18,392	0	0	0
Gibola	0	8,779	0	0	8,779	0	8,779	0	0	0
Gila	1,686	12,578	470	0	14,734	800	13,934	0	0	0
Lincoln	0	571	0	0	571	0	571	0	0	0
Santa Fe	758	8,129	2,703	0	11,590	0	11,590	0	0	0
Subtotal	10,685	40,635	3,473	0	54,793	1,527	53,266	0	0	0
New York										
Green Mountain	0	775	203	0	978	73	905	0	0	0

See footnotes at end of table.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+					Total Acres	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+						
North Carolina										
North Carolina	80	1,563	2,651	2,367		6,661	3,972	2,389	300	0
Ohio										
Wayne	0	0	1,056	4,226		5,282	2,719	1,221	0	1,342
Oklahoma										
Ouachita	0	1,579	0	237		1,816	798	1,018	0	0
Oregon										
Deschutes	3,883	6,074	7,444	139		17,540	3,730	13,810	0	0
Fremont	6,626	4,330	0	0		10,956	2,000	8,956	0	0
Malheur	8,313	10,260	0	0		18,573	246	18,327	0	0
Mt. Hood	100	8,179	15,265	2,295		25,839	861	9,214	15,764	0
Ochoco	7,908	1,490	0	0		9,398	50	9,348	0	0
Rogue River	0	263	10,714	438		11,415	9,210	1,385	820	0
Siskiyou	69	4,295	23,983	8,397		36,744	24,745	8,530	3,469	0
Siuslaw	0	0	0	7,106		7,106	4,306	2,800	0	0
Umatilla	547	1,327	0	0		1,874	100	1,774	0	0
Umpqua	0	7,775	27,733	5,118		40,626	5,987	12,658	21,981	0
Wallowa-Whitman	1,076	8,467	1,106	0		10,649	2,023	8,626	0	0
Willamette	0	637	10,224	18,997		29,858	5,601	10,367	13,890	0
Winema	13,201	3,309	836	248		17,594	402	17,185	7	0
Subtotal	41,723	56,406	97,305	42,738		238,172	59,261	122,980	55,931	0
Puerto Rico										
Caribbean	0	300	1,163	0		1,463	863	600	0	0
South Carolina										
South Carolina	0	329	1,449	1,515		3,293	1,201	1,738	354	0
South Dakota										
Black Hills	9,070	0	0	0		9,070	0	9,070	0	0
Custer	30	0	0	0		30	0	30	0	0
Subtotal	9,100	0	0	0		9,100	0	9,100	0	0
Tennessee										
Cherokee	0	1,354	641	1,123		3,118	2,141	977	0	0

See footnotes at end of table.

Table 24—Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class—Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+				Total Acres	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	20-49	50-84	85-119	120+					
Texas									
Texas	0	1,144	2,916	1,525	5,585	4,066	1,519	0	0
Utah									
Ashley	2,797	438	0	0	3,235	50	3,185	0	0
Dixie	3,240	12,475	0	0	15,715	876	14,839	0	0
Fishlake	0	225	0	0	225	225	0	0	0
Manti-LaSal	0	1,361	0	0	1,361	0	1,361	0	0
Uinta	0	0	217	0	217	217	0	0	0
Wasatch	485	140	0	0	625	0	625	0	0
Subtotal	6,522	14,639	217	0	21,378	1,368	20,010	0	0
Vermont									
Green Mountain	1,241	2,296	443	0	3,980	2,324	1,656	0	0
Virginia									
George Washington	0	492	0	1,007	1,499	993	335	0	171
Jefferson	37	1,659	322	519	2,537	1,005	1,532	0	0
Subtotal	37	2,151	322	1,526	4,036	1,998	1,867	0	171
Washington									
Colville	379	3,198	1,761	0	5,338	1,832	3,506	0	0
Gifford Pinchot	28	22,671	10,448	7,778	40,925	1,054	33,229	6,642	0
Idaho Panhandle	35	33	657	471	1,196	335	861	0	0
Mt. Baker-Snoqualmie	0	1,680	6,541	2,962	11,183	647	8,776	1,760	0
Okanogan	3,026	1,123	0	0	4,149	388	3,761	0	0
Olympic	47	968	7,875	880	9,770	290	4,551	4,929	0
Umatilla	0	1,631	0	0	1,631	0	1,631	0	0
Wenatchee	3,558	15,055	3,230	0	21,843	5,091	15,474	1,278	0
Subtotal	7,073	46,359	30,512	12,091	96,035	9,637	71,789	14,609	0

See footnotes at end of table.

Table 24--Timber-stand improvement needs as of October 1, 1987, by State, Forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber-stand improvement Cubic foot productivity classes 2/ 20-49 50-84 85-119 120+					Acres			Total subtotal	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
West Virginia													
George Washington	0	33	0	103					136	136	0	0	0
Monongahela	0	112	867	247					1,226	906	320	0	0
Subtotal	0	145	867	350					1,362	1,042	320	0	0
Wisconsin													
Chequamegon	7	727	62	0					796	776	20	0	0
Nicolet	37	1,330	1,043	236					2,646	930	200	0	1,516
Subtotal	44	2,057	1,105	236					3,442	1,706	220	0	1,516
Wyoming													
Bighorn	28,963	882	0	0					29,845	26,624	3,221	0	0
Black Hills	400	0	0	0					400	0	400	0	0
Bridger-Teton	180	322	966	0					1,468	0	1,468	0	0
Medicine Bow	4,135	3,641	22	0					7,798	1,149	6,649	0	0
Shoshone	8,077	1,565	0	0					9,642	1,260	8,382	0	0
Subtotal	41,755	6,410	988	0					49,153	29,033	20,120	0	0
Total	197,243	447,050	357,832	229,338					1,231,463	476,659	659,604	83,992	11,208

1/ States not listed had no timber-stand improvement needs as of October 1, 1987.

2/ Cubic foot productivity class refers to the cubic feet of wood produced per acre per year in a natural unmanaged stand.

Table 25—Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest—
fiscal year 1987

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber-stand improvement					
	Artificial regeneration		Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/ site prep. 2/	w/o site prep. 2/						
Acres										
Alabama	1,957	0	500	0	2,457	3,565	0	0	0	3,565
Alabama										
Alaska	0	0	0	80	80	0	19	0	0	19
Tongass-Chatam	0	0	0	7,701	7,701	558	4,647	0	0	5,205
Tongass-Ketchikan	0	0	0	662	662	0	1,732	0	0	1,732
Tongass-Stikine										
Subtotal	0	0	0	8,443	8,443	558	6,398	0	0	6,956
Arizona										
Apache-Sitgreaves	74	0	0	0	74	0	0	0	0	0
Coconino	0	0	0	0	0	0	2,692	0	0	2,692
Kaibab	658	0	0	0	658	0	5,610	0	0	5,610
Prescott	44	0	0	51	95	0	212	0	0	212
Subtotal	776	0	0	51	827	0	8,514	0	0	8,514
Arkansas										
Ouachita	14,779	700	1,653	0	17,132	15,647	196	0	0	15,843
Ozark and St. Francis	2,841	0	2,120	0	4,961	4,540	2,250	0	0	6,790
Subtotal	17,620	700	3,773	0	22,093	20,187	2,446	0	0	22,633
California										
Angeles	0	0	0	0	0	324	28	0	28	380
Inyo	278	0	0	0	278	0	800	0	0	800
Klamath	715	0	0	0	715	383	746	0	0	1,129
Lassen	0	0	0	0	0	935	1,252	0	0	2,187
Modoc	2,375	0	0	0	2,375	0	0	0	0	0
Plumas	1,001	0	0	0	1,001	657	15	0	0	672

See footnotes at end of table.

Table 25—Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest—
fiscal year 1987—Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation			Timber-stand improvement					
	Artificial regeneration Planted	Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
		w/ site prep. 2/	w/o site prep. 2/						
Acres									
San Bernardino	196	0	0	196	195	45	0	0	240
Sequoia	107	0	0	107	0	0	0	0	0
Shasta-Trinity	4,209	0	0	4,209	678	646	0	0	1,324
Stanislaus	97	0	0	97	63	8	0	0	71
Tahoe	483	0	0	483	0	0	0	0	0
Toiyabe	1,329	0	0	1,329	0	942	0	0	942
Subtotal	10,790	0	0	10,790	3,235	4,482	0	28	7,745
Colorado									
Arapaho and Roosevelt	0	0	200	911	1,037	2,227	0	0	3,264
Grand Mesa, Uncompahgre, and Gunnison	0	113	15	238	0	2,445	0	0	2,445
Pike and San Isabel	193	0	261	612	18	509	0	0	527
Rio Grande	0	0	0	324	133	652	0	0	785
Routt	36	0	434	470	231	225	0	0	456
San Juan	386	0	0	486	1,059	0	0	0	1,059
White River	0	0	0	0	410	0	0	0	410
Subtotal	615	113	910	3,041	2,888	6,058	0	0	8,946
Florida									
Florida	6,477	1,949	0	8,426	208	0	3,934	0	4,142
Georgia									
Georgia	5,434	0	1,550	6,984	5,684	0	0	0	5,684
Idaho									
Boise	159	0	0	159	0	393	0	0	393
Challis	33	0	0	33	0	0	0	0	0
Clearwater	1,619	13	182	2,171	122	491	0	0	613
Idaho Panhandle	4,151	0	1,124	6,100	1,223	5,647	0	0	6,870
Kootenai	174	0	0	221	0	45	0	0	45

See footnotes at end of table.

Table 25—Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest—
fiscal year 1987—Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation			Timber-stand improvement				
	Artificial regeneration Planted	Natural w/ site prep. 2/	Natural regeneration w/o site prep. 2/	Total	Release	Thinning	Fertili- zation	Pruning
	Seeded			Acres				
Nezperce	4,553	0	11	5,606	502	420	0	0
Payette	2,982	0	534	3,516	0	869	0	0
Salmon	368	0	949	1,654	0	101	0	0
Targhee	8,604	0	728	9,332	218	686	0	0
Subtotal	22,643	13	3,528	28,792	2,065	8,652	0	0
Illinois Shawnee	373	0	179	552	127	0	0	0
Indiana Hoosier	200	0	867	1,067	333	0	0	0
Kentucky Daniel Boone	788	0	649	1,437	697	0	0	0
Louisiana Kisatchie	1,851	0	0	1,851	520	0	0	0
Maine White Mountain	0	0	120	127	79	269	0	0
Michigan Hiawatha	1,751	0	1,322	3,216	696	11	0	24
Huron-Manistee	1,338	0	1,839	3,833	2,108	258	0	0
Ottawa	704	0	3,582	5,993	1,618	73	0	0
Subtotal	3,793	0	6,743	13,042	4,422	342	0	24
Minnesota Chippewa	1,504	36	3,738	5,372	1,903	0	0	0
Superior	2,810	970	1,059	4,936	5,992	407	0	0
Subtotal	4,314	1,006	4,797	10,308	7,895	407	0	0

See footnotes at end of table.

Table 25--Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest--
fiscal year 1987--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber-stand improvement					
	Artificial regeneration		Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/ site prep. 2/	w/o site prep. 2/						
Mississippi Mississippi	16,088	0	2,559	0	18,647	4,849	1,285	239	0	6,373
Missouri Mark Twain	1,200	473	7,677	0	9,350	2,256	879	0	0	3,135
Montana										
Beaverhead	1,807	0	266	890	2,963	126	810	0	0	936
Bitterroot	2,824	0	121	372	3,317	358	661	0	0	1,019
Custer	0	0	20	26	46	207	224	0	0	431
Deerlodge	169	0	190	84	443	1,263	409	0	0	1,672
Flathead	4,255	122	2,695	1,545	8,617	168	1,980	0	0	2,148
Gallatin	2,476	69	1,354	562	4,461	1	893	0	0	894
Helena	1,333	0	371	164	1,868	14	232	0	0	246
Kootenai	7,830	0	3,297	1,701	12,828	139	3,915	0	0	4,054
Lewis and Clark	825	20	460	844	2,149	205	483	0	0	688
Lolo	3,572	54	653	798	5,077	24	1,239	0	0	1,263
Subtotal	25,091	265	9,427	6,986	41,769	2,505	10,846	0	0	13,351
Nebraska Nebraska	0	0	0	0	0	0	205	0	0	205
New Hampshire White Mountain	0	0	161	0	161	0	170	0	0	170
New Mexico										
Carson	1,090	0	0	0	1,090	744	3,035	0	0	3,779
Cibola	1,879	0	0	0	1,879	0	1,775	0	0	1,775
Gila and Apache	907	0	0	0	907	0	2,750	0	0	2,750
Lincoln	65	0	0	148	213	0	638	0	0	638
Santa Fe	728	0	0	0	728	0	5,005	0	0	5,005
Subtotal	4,669	0	0	148	4,817	744	13,203	0	0	13,947
North Carolina North Carolina	2,420	0	1,604	0	4,024	1,658	250	0	0	1,908

See footnotes at end of table.

Table 25--Reforestation and timber-stand improvement acreages certified as satisfactory stocked, by State and National Forest--
fiscal year 1987--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber-stand improvement					
	Artificial regeneration		Natural regeneration		Total Acres	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/ site prep. 2/	w/o site prep. 2/						
Ohio	176	0	463	20	659	801	0	0	0	801
Wayne										
Oklahoma	2,129	103	408	0	2,640	921	792	0	0	1,713
Ouachita										
Oregon	6,556	0	1,326	0	7,882	479	592	0	0	1,071
Deschutes	570	0	0	0	570	0	2,546	0	0	2,546
Fremont	440	0	8	452	900	0	180	0	0	180
Malheur	3,414	0	2,396	274	6,084	0	2,561	3,148	0	5,709
Mt. Hood	641	0	40	0	681	0	0	0	0	0
Ochoco	3,534	0	0	0	3,534	1,510	10	0	0	1,520
Rogue River	1,040	0	0	0	1,040	800	144	0	0	944
Siskiyou	760	0	0	0	760	2,544	1,830	0	405	4,779
Siuslaw	2,430	0	10	300	2,740	0	1,545	0	0	1,545
Umatilla	4,137	0	262	0	4,399	0	985	1,090	0	2,075
Umpqua	1,252	285	255	160	1,952	398	608	0	0	1,006
Wallowa-Whitman	7,770	0	92	97	7,959	333	4,728	3,133	0	8,194
Willamette	6,783	0	0	213	6,996	0	1,866	0	0	1,866
Winema										
Subtotal	39,327	285	4,389	1,496	45,497	6,064	17,595	7,371	405	31,435
Pennsylvania	0	0	397	16	413	0	216	0	0	216
Allegheny										
Puerto Rico	0	0	0	0	0	800	0	0	0	800
Caribbean										
South Carolina	4,059	0	806	0	4,865	1,514	1,997	2,073	0	5,584
South Carolina										
South Dakota	0	0	0	0	0	0	11,033	0	0	11,033
Black Hills	0	0	0	0	0	0	39	0	0	39
Custer										
Subtotal	0	0	0	0	0	0	11,072	0	0	11,072
Tennessee	1,610	0	987	0	2,597	2,076	176	0	0	2,252
Cherokee										
Texas	1,637	0	1,125	0	2,762	90	1,161	0	0	1,251
Texas										

See footnotes at end of table.

Table 25—Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest—
fiscal year 1987—Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber-stand improvement					
	Artificial regeneration		Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/ site prep. 2/	w/o site prep. 2/						
Acres										
Utah										
Ashley	0	0	653	0	653	50	1,058	0	0	1,108
Dixie	292	0	0	0	292	50	2,072	0	0	2,122
Fishlake	0	0	0	0	0	35	45	0	0	80
Uinta	0	0	60	0	60	150	0	0	0	150
Wasatch	0	0	0	0	0	914	0	0	0	914
Subtotal	292	0	713	0	1,005	1,199	3,175	0	0	4,374
Vermont										
Green Mountain	0	0	217	0	217	79	130	0	0	209
Virginia										
George Washington	365	0	2,439	0	2,804	774	53	0	0	827
Jefferson	738	0	1,759	0	2,497	1,641	1,216	20	0	2,877
Subtotal	1,103	0	4,198	0	5,301	2,415	1,269	20	0	3,704
Washington										
Colville	1,048	0	143	0	1,191	147	550	0	0	697
Gifford Pinchot	16,579	0	74	200	16,853	11	6,417	0	0	6,428
Idaho Panhandle	160	0	6	66	232	0	200	0	0	200
Mt. Baker-Snoqualmie	6,029	0	0	481	6,510	14	2,365	1,036	0	3,415
Okanogan	209	0	0	0	209	0	0	0	0	0
Olympic	5,121	0	22	59	5,202	500	1,861	3,351	0	5,712
Umatilla	90	0	0	9	99	0	0	0	0	0
Wenatchee	4,535	0	280	865	5,680	0	1,242	0	0	1,242
Subtotal	33,771	0	525	1,680	35,976	672	12,635	4,387	0	17,694
West Virginia										
George Washington	252	0	117	0	369	65	0	0	0	65
Monongahela	9	0	113	0	122	865	378	0	0	1,243
Subtotal	261	0	230	0	491	930	378	0	0	1,308

See footnotes at end of table.

Table 25—Reforestation and timber-stand improvement acreages certified as satisfactorily stocked, by State and National Forest—
fiscal year 1987—Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber-stand improvement					
	Artificial regeneration		Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/ site prep. 2/	w/o site prep. 2/						
Acres										
Wisconsin										
Chequamegon	1,204	0	3,510	0	4,714	1,256	91	0	78	1,425
Nicolet	987	0	1,770	738	3,495	1,176	0	0	9	1,185
Subtotal	2,191	0	5,280	738	8,209	2,432	91	0	87	2,610
Wyoming										
Big Horn	210	0	0	0	210	0	125	0	0	125
Black Hills	0	0	0	0	0	0	1,383	0	0	1,383
Bridger-Teton	0	0	0	0	0	0	904	0	0	904
Medicine Bow	0	0	1,556	143	1,699	845	1,512	0	0	2,357
Shoshone	0	0	0	0	0	0	284	0	0	284
Subtotal	210	0	1,556	143	1,909	845	4,208	0	0	5,053
Total	213,865	4,907	66,338	26,436	311,546	85,313	119,301	18,024	544	223,182

1/ States not listed had no certification in fiscal year 1987.

2/ W/ site prep. = with site preparation; w/o site prep. = without site preparation.

Table 26—Certification of reforestation and timber-stand improvement acreages, by Region—fiscal year 1987

Region	Reforestation				Timber-stand improvement					
	Planted	Seeded	Natural regeneration		Total	Release	Precommercial thinning	Fertilization	Pruning	Total
			With site preparation	Without site preparation						
Northern	35,748	278	10,750	9,323	56,099	4,352	17,688	0	0	22,040
Rocky Mountain	825	113	2,466	1,546	4,950	3,733	20,600	0	0	24,333
Southwest	5,445	0	0	199	5,644	744	21,717	0	0	22,461
Intermountain	13,767	0	2,924	337	17,028	1,417	7,070	0	0	8,487
Pacific Southwest	9,461	0	0	0	9,461	3,235	3,540	0	28	6,803
Pacific Northwest	72,938	285	4,908	3,110	81,241	6,736	30,030	11,758	405	48,929
Southern	63,425	2,752	18,276	0	84,453	45,249	9,376	6,266	0	60,891
Eastern	12,256	1,479	27,014	3,478	44,227	19,289	2,882	0	111	22,282
Alaska	0	0	0	8,443	8,443	558	6,398	0	0	6,956
Total	213,865	4,907	66,338	26,436	311,546	85,313	119,301	18,024	544	223,182

Table 27—Total recreation use on National Forest System lands by State—fiscal years 1983-87

State, Commonwealth, Territory 1/	1987	1986	1985	1984	1983
	1,000 RVD's 2/				
Alabama	850.4	771.0	871.9	1,053.7	1,048.0
Alaska	4,085.3	3,584.6	4,851.7	3,519.6	4,144.0
Arizona	18,839.8	17,451.6	14,664.1	16,376.7	16,557.0
Arkansas	2,278.7	2,213.7	2,206.0	2,251.3	2,292.9
California	57,975.4	55,745.9	55,314.3	55,476.3	53,137.1
Colorado	22,583.3	20,158.7	21,115.7	20,734.9	20,037.9
Florida	2,731.5	2,637.2	2,532.9	2,630.0	3,054.0
Georgia	2,669.4	2,314.5	2,304.0	2,275.6	2,271.5
Idaho	10,806.5	10,342.1	10,220.7	10,505.9	10,117.0
Illinois	830.0	972.6	972.7	801.4	799.0
Indiana	483.2	425.1	393.1	388.7	766.1
Kansas	21.8	21.0	19.2	16.5	14.8
Kentucky	2,248.7	2,162.9	2,152.5	2,090.4	2,066.8
Louisiana	418.1	475.7	430.8	480.2	497.1
Maine	47.6	46.1	47.5	51.6	51.5
Michigan	4,409.8	4,196.7	4,133.6	4,652.5	5,398.4
Minnesota	4,382.3	4,297.5	4,391.9	4,302.5	4,387.2
Mississippi	1,179.5	1,128.3	1,115.8	1,246.0	1,365.8
Missouri	1,716.4	1,693.6	1,761.4	1,706.9	1,964.4
Montana	9,912.3	8,899.8	10,020.7	9,388.1	9,380.6
Nebraska	163.0	106.8	115.1	129.4	130.8
Nevada	2,353.8	2,148.6	2,074.1	2,059.1	2,592.7
New Hampshire	2,474.1	2,259.5	2,374.9	2,286.2	2,333.4
New Mexico	6,446.6	6,015.5	6,975.7	6,416.1	6,870.0
New York	22.8	23.2	22.9	22.3	23.0
North Carolina	4,572.1	4,258.1	3,667.7	4,085.7	4,088.6
North Dakota	131.3	142.0	135.5	357.5	133.7
Ohio	411.7	381.0	375.6	376.3	398.7
Oklahoma	320.6	357.0	377.2	398.8	404.8
Oregon	19,210.1	19,294.9	19,060.6	20,139.5	18,245.5
Pennsylvania	2,394.1	2,067.6	1,948.9	2,000.8	2,282.4
Puerto Rico	382.2	539.1 3/	468.5	530.2	544.5
South Carolina	920.0	845.1	919.3	1,004.1	1,072.3
South Dakota	2,687.4	2,692.4	3,495.4	2,556.1	2,271.1
Tennessee	2,432.2	2,170.4	2,107.2	2,525.2	2,851.0
Texas	1,923.9	1,958.7	1,623.1	1,965.2	1,868.4
Utah	13,736.9	13,179.4	13,914.3	13,621.1	13,330.4
Vermont	1,029.1	11,142.9	850.5	609.2	606.2
Virginia	3,726.4	3,498.7	3,511.2	3,516.4	3,993.6
Washington	15,058.3	14,863.9	12,690.2	13,986.8	14,514.5
West Virginia	1,137.2	1,265.6	1,334.0	1,370.4	1,433.2
Wisconsin	1,952.5	1,909.8	1,942.8	1,928.9	1,838.9
Wyoming	6,502.0	5,873.9	5,902.1	5,719.8	6,529.0
Total	238,458.3	226,532.7	225,407.3	227,553.9	227,707.8

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

3/ From Puerto Rico through Wyoming, totals correct misprinted data from 1986 Annual Report.

Report of the Forest Service Fiscal Year 1987

Table 28—State summary of total recreation use on National Forest System lands by activity—fiscal year 1987

State, <u>1/</u> Commonwealth, or Territory	Camping, picnicking & swimming	Mechanized travel & viewing scenery	Hiking, horseback riding & water travel	Winter sports	Resorts, cabins & organization camps
	1,000 RVD's <u>2/</u>				
Alabama	234.6	196.4	72.9	.1	
Alaska	294.6	2,553.0	301.3	108.4	127.9
Arizona	5,526.7	8,205.8	1,574.8	221.2	872.5
Arkansas	697.0	483.4	170.3		14.8
California	17,431.2	20,566.3	3,849.3	3,170.8	6,466.7
Colorado	4,882.7	5,976.5	1,910.6	5,360.7	665.6
Florida	1,534.7	392.3	146.5		207.1
Georgia	797.5	793.3	299.2	1.9	45.5
Idaho	3,169.7	3,167.9	993.0	550.7	569.1
Illinois	217.0	300.1	117.9		.3
Indiana	198.6	49.9	53.5		1.0
Kansas	4.2	9.8	.7		
Kentucky	617.8	738.6	314.7	.8	17.3
Louisiana	149.9	73.6	11.9		39.1
Maine	15.4	5.9	9.1	.7	2.0
Michigan	1,140.4	1,613.5	272.4	87.8	91.1
Minnesota	1,275.7	901.3	457.7	191.6	347.4
Mississippi	286.1	258.3	104.8		6.0
Missouri	506.2	490.5	216.4	.1	10.7
Montana	2,182.6	2,866.5	1,230.5	478.0	444.9
Nebraska	46.2	52.3	22.7	.3	14.4
Nevada	679.1	423.5	153.7	215.2	96.6
New Hampshire	593.2	726.1	469.1	518.8	78.5
New Mexico	2,155.7	1,476.9	659.7	530.2	208.2
New York	11.1	1.0	1.6	1.4	
North Carolina	1,266.1	1,558.5	643.2	7.4	59.4
North Dakota	17.4	24.3	7.6	1.4	
Ohio	77.6	92.8	52.3	1.0	
Oklahoma	57.7	133.1	24.2		
Oregon	6,112.3	5,678.7	1,703.9	873.3	1,216.8
Pennsylvania	653.2	631.9	145.9	6.0	66.2
Puerto Rico	152.0	126.2	35.0		21.0
South Carolina	243.5	269.8	128.0		1.3
South Dakota	212.6	1,929.3	103.8	14.5	114.1
Tennessee	968.9	661.7	257.9	1.8	98.2
Texas	503.9	254.0	53.4		6.1
Utah	5,082.8	3,777.6	1,096.0	920.3	612.7
Vermont	34.0	117.3	52.2	639.8	44.0
Virginia	981.4	1,120.4	323.2	16.1	51.7
Washington	4,369.1	4,560.3	1,195.1	901.2	1,723.8
West Virginia	453.8	175.2	100.4	3.2	20.5
Wisconsin	520.2	648.7	84.9	19.0	21.4
Wyoming	1,700.1	1,731.2	930.3	357.0	447.4
Total	68,104.5	75,813.7	20,351.6	15,200.7	14,831.3

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Hunting	Fishing	Nature studies	Other recreation activities	Total use	State, 1/ Commonwealth, or Territory
1,000 RVD's 2/					
221.9	68.3	16.6	39.6	850.4	Alabama
145.5	395.1	23.5	136.0	4,085.3	Alaska
671.3	696.9	98.7	971.9	18,839.8	Arizona
487.2	294.6	20.4	111.0	2,278.7	Arkansas
1,417.3	2,954.5	297.1	1,822.2	57,975.4	California
938.6	2,054.8	90.6	703.2	22,583.3	Colorado
201.5	156.0	15.3	78.1	2,731.5	Florida
372.8	252.9	32.7	73.6	2,669.4	Georgia
804.0	822.8	54.4	674.9	10,806.5	Idaho
102.4	48.2	15.2	28.9	830.0	Illinois
94.9	72.4	3.1	9.8	483.2	Indiana
3.8	2.7	.4	.2	21.8	Kansas
170.1	271.7	29.8	87.9	2,248.7	Kentucky
96.2	27.1	2.0	18.3	418.1	Louisiana
7.8	4.1	1.4	1.2	47.6	Maine
561.5	440.3	23.6	179.2	4,409.8	Michigan
331.5	717.6	17.3	142.2	4,382.3	Minnesota
382.1	79.7	17.9	44.6	1,179.5	Mississippi
284.1	104.3	14.3	89.8	1,716.4	Missouri
943.3	783.1	86.1	897.3	9,912.3	Montana
10.8	5.3		11.0	163.0	Nebraska
201.3	106.4	45.5	432.5	2,353.8	Nevada
33.7	22.8	10.5	21.4	2,474.1	New Hampshire
511.4	272.2	56.4	575.9	6,446.6	New Mexico
1.4	5.2	.1	1.0	22.8	New York
576.4	238.4	57.2	165.5	4,572.1	North Carolina
73.3	2.7	.7	3.9	131.3	North Dakota
114.4	46.1	3.6	23.9	411.7	Ohio
61.0	18.6	11.1	14.9	320.6	Oklahoma
1,299.1	995.9	301.0	1,029.1	19,210.1	Oregon
545.6	284.9	14.4	46.0	2,394.1	Pennsylvania
		2.0	46.0	382.2	Puerto Rico
164.2	43.5	10.0	59.7	920.0	South Carolina
148.2	68.4	3.9	92.6	2,687.4	South Dakota
214.0	158.1	20.7	50.9	2,432.2	Tennessee
202.7	877.1	7.4	19.3	1,923.9	Texas
804.0	901.1	99.5	442.9	13,736.9	Utah
52.7	6.3	2.6	30.2	1,029.1	Vermont
675.2	316.5	43.9	198.0	3,726.4	Virginia
852.9	578.5	106.9	770.5	15,058.3	Washington
202.5	120.8	4.3	56.5	1,137.2	West Virginia
208.2	386.5	7.4	56.2	1,952.5	Wisconsin
515.2	467.5	40.6	312.7	6,502.0	Wyoming
15,706.0	16,169.9	1,710.1	10,570.5	238,458.3	Total

Table 29—Trail miles on the National Forest System by State—fiscal years 1985-87 1/

State, Commonwealth, or Territory 2/	1987		1986		1985	
	Total	Constructed 3/	Total	Constructed 3/	Total	Constructed 3/
Alabama	236	7	117	0	230	5
Alaska	656	28	629	6	700	29
Arizona	3,817	22	333	7	3,546	0
Arkansas	400	12	150	1	1,800	0
California	11,839	222	6,493	150	11,030	160
Colorado	8,288	97	4,135	226	8,288	12
Florida	267	0	162	0	267	1
Georgia	527	7	231	0	320	10
Idaho	16,316	108	8,238	80	6,887	131
Illinois	205	0	205	0	205	4
Indiana	120	0	62	0	142	0
Kentucky	542	4	187	8	195	7
Louisiana	127	13	88	0	41	11
Maine	108	0	108	0	108	0
Michigan	2,091	46	1,776	54	1,537	32
Minnesota	2,651	4	2,647	23	2,415	68
Mississippi	392	6	104	3	87	0
Missouri	603	0	568	10	568	13
Montana	12,820	68	6,488	93	6,196	58
Nebraska	39	1	22	1	39	0
Nevada	1,523	5	315	26	1,529	60
New Hampshire	1,275	5	1,275	0	1,364	2
New Mexico	3,511	12	964	18	1,500	15
New York	25	0	25	0	25	0
North Carolina	1,463	8	777	1	732	12
Ohio	122	12	99	5	104	0
Oklahoma	82	0	30	0	82	0
Oregon	8,514	99	5,028	90	4,893	88
Pennsylvania	428	75	355	0	342	0
Puerto Rico	31	1	25	1	31	0
South Carolina	520	12	180	0	516	3
South Dakota	138	3	123	3	137	24
Tennessee	582	6	161	0	162	0
Texas	193	10	190	8	125	10
Utah	5,060	24	2,143	100	2,652	19
Vermont	594	6	550	2	613	11
Virginia	1,867	12	393	20	380	7
Washington	7,042	65	4,431	142	4,529	140
West Virginia	837	0	233	0	305	3
Wisconsin	1,343	7	1,343	0	841	0
Wyoming	5,313	39	2,303	14	3,268	52
Total	102,507	1,046	53,686	1,092	99,468	987
					60,349	

1/ Includes work accomplished by Human Resource Programs and volunteers.

2/ States not listed have no Forest Service recreation program.

3/ Miles constructed includes construction of new trails and reconstruction of existing trails. The predominant activity is reconstruction.

Table 30—Status of the National Forest System units of the National Wilderness Preservation System—calendar years 1983-87

State, Commonwealth, or Territory 2/	1987 1/	1986	1985	1984	1983
	1,000 acres 3/				
Alabama	19	19	19	19	19
Alaska	5,453	5,453	5,453	5,453	5,453
Arizona	1,316	1,316	1,320	1,320	557
Arkansas	115	116	116	116	25
California	3,922	3,920	3,920	3,920	2,139
Colorado	2,587	2,584	2,586	2,586	2,561
Florida	73	73	73	73	23
Georgia	89	89	47	47	32
Idaho	3,960	3,957	3,827	3,827	3,825
Indiana	13	13	13	13	13
Kentucky	17	18	18	5	5
Louisiana	9	9	9	9	9
Michigan	92	0	0	0	0
Minnesota	798	798	798	798	793
Mississippi	7	5	5	5	0
Missouri	63	63	63	63	47
Montana	3,372	3,371	3,366	3,366	3,107
Nebraska	8	8	0	0	0
Nevada	65	65	65	65	65
New Hampshire	103	103	103	103	26
New Mexico	1,388	1,391	1,387	1,387	1,402
North Carolina	101	101	100	100	31
Oregon	2,078	2,078	2,077	2,077	1,214
Pennsylvania	9	10	10	10	0
South Carolina	17	17	17	17	17
South Dakota	10	10	10	10	10
Tennessee	67	67	33	33	8
Texas	36	35	34	34	0
Utah	775	780	780	780	30
Vermont	59	59	59	59	17
Virginia	65	65	65	65	9
Washington	2,571	2,573	2,521	2,521	1,501
West Virginia	78	73	78	78	77
Wisconsin	42	44	44	44	20
Wyoming	3,081	3,081	3,086	3,086	2,193
Total	32,458	32,369 4/	32,102	32,089	25,228

1/ Includes all areas added to the Wilderness Preservation System through the first session of the 100th Congress.

2/ States not listed have no National Forest System acres in the National Wilderness Preservation System.

3/ Acreage for most states is estimated pending final map compilation; therefore, minor changes may occur between years.

4/ Includes all acres added to or deleted from the Wilderness Preservation System through the end of the first session, 100th Congress.

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Table 31—Additions to the National Wilderness Preservation System—fiscal year 1987 1/

Public Law	State	Date	Number of new areas	Number of additions	Number of adjustments	Acres
H.R. 148	Michigan	12/10/87	10	0	0	91,535
Total			10	0	0	91,535

1/ Includes all acres added to the Wilderness Preservation System by the first session of the 100th Congress.

**Table 32—Additions to the National Wild and Scenic Rivers System—
fiscal year 1987 1/**

River	State	Date	Miles
Merced	California	11/2/87	114 (29.5 miles NFS)
Kern	California	11/24/87	151 (124 miles NFS)
Kings	California	11/3/87	81 (25.5 miles NFS)
Total			346

1/ Includes all rivers added to the National Wild and Scenic Rivers System by the 100th Congress.

Table 33—Wildlife and fish habitat improvement by Region—fiscal year 1987

Region	Wildlife	Resident & Anadromous fish	Threatened, endangered, & sensitive species	Total 1/
Northern				
Acres	6,913	365	1,143	8,421
Structures	41	471	22	534
Rocky Mountain				
Acres	12,778	85	40	12,903
Structures	349	352	26	727
Southwestern				
Acres	13,988	15	3,736	17,739
Structures	30	104	125	259
Intermountain				
Acres	9,264	143	200	9,607
Structures	658	361	83	1,102
Pacific Southwest				
Acres	6,870	65	238	7,173
Structures	96	342	116	554
Pacific Northwest				
Acres	5,460	227	504	6,191
Structures	711	2,408	103	3,222
Southern				
Acres	19,238	1,412	16,171	36,821
Structures	83	486	6	575
Eastern				
Acres	18,779	2,729	1,789	23,297
Structures	2,045	829	48	2,922
Alaska				
Acres	910	1,076	0	1,986
Structures	140	9	0	149
Total				
Acres	94,200	6,117	23,821	124,138
Structures	4,153	5,362	529	10,044

1/ Does not include activities that are accomplished in support of other resource programs.

Table 34—Range allotment management status by Region—fiscal year 1987

Region	Total	Number of allotments		Acres	
		Improved management started	Improved management maintained	Total	Suitable 1/
Northern	1,675	4	1,336	8,304,892	3,371,427
Rocky Mountain	2,479	99	1,803	18,563,311	9,319,197
Southwestern	1,419	53	1,059	21,878,612	13,193,712
Intermountain	1,876	6	1,480	26,049,710	11,219,162
Pacific Southwest	797	24	583	11,665,924	4,903,188
Pacific Northwest	719	37	492	11,539,538	6,347,737
Southern	448	0	426	1,715,084	1,233,184
Eastern	197	2	155	95,645	47,129
Total	9,610	225	7,334	99,812,716	49,634,736

1/ Suitable acres are acres accessible to livestock and which can be grazed on a sustained yield basis without damage to the resource.

Table 35—Range allotment management status—fiscal years 1983-87

	1987	1986	1985	1984	1983
Total allotments 1/	9,610	9,658 2/	10,223	10,296	10,417
Improved management started (number of allotments)	225	338	351	471	534
Improved management maintained (number of allotments)	7,335	7,503	7,237	7,018	7,125
Total acres (million acres)	100	103	105	105	104
Suitable acres (million acres)	50	50	50	51	52
Permitted use (million AUM's 3/)	9.9	10.1	10.1	10.1	10.1
Actual use (million AUM's)	8.4	8.7	8.8	8.8	8.8

1/ Does not include vacant allotments.

2/ Adjusted downward by 729 to correct an error in FY 1986 data.

3/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow or the equivalent for 1 month.

Table 36—Actual grazing use by State—fiscal year 1987

State, Commonwealth, or Territory 1/	Cattle	Sheep	Domestic horses	Wild horses AUM's 2/	Wild burros	Total
Alabama	2,447	0	48	0	0	2,495
Arizona	1,208,958	12,384	13,482	72	346	1,235,242
Arkansas	28,571	0	72	0	0	28,643
California	512,023	51,986	14,189	6,430	720	585,348
Colorado	782,952	142,303	19,281	0	0	944,536
Florida	7,220	0	0	0	0	7,220
Georgia	5,208	0	0	0	0	5,208
Idaho	583,247	188,416	10,712	0	0	782,375
Illinois	17,518	3,018	43	0	0	20,579
Kansas	44,577	0	52	0	0	44,629
Kentucky	91	0	0	0	0	91
Louisiana	22,339	0	8	0	0	22,347
Michigan	493	0	0	0	0	493
Minnesota	605	0	0	0	0	605
Mississippi	6,960	0	0	0	0	6,960
Missouri	30,642	0	16	0	0	30,658
Montana	490,502	17,888	13,384	0	0	521,774
Nebraska	131,888	0	314	0	0	132,202
Nevada	238,455	41,431	12,171	3,781	0	295,838
New Mexico	781,019	27,364	10,702	1,685	22	820,792
New York	9,300	0	24	0	0	9,324
North Dakota	444,845	272	4,064	0	0	449,181
Ohio	869	0	0	0	0	869
Oklahoma	23,189	0	26	0	0	23,215
Oregon	438,792	33,970	2,619	2,088	0	477,469
South Carolina	209	0	0	0	0	209
South Dakota	441,797	4,567	971	0	0	447,335
Texas	35,157	0	9	0	0	35,166
Utah	463,405	196,124	444	0	0	659,973
Vermont	280	0	0	0	0	280
Virginia	5,836	0	555	0	0	6,391
Washington	98,558	9,936	3,309	0	0	111,803
West Virginia	9,181	268	67	0	0	9,516
Wisconsin	103	0	0	0	0	103
Wyoming	549,141	146,548	14,197	0	0	709,886
Total	7,416,377	876,475	120,759	14,056	1,088	8,428,755

1/ States not listed had no Forest Service grazing program in 1987.

2/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.

Table 37—Annual grazing statistics—fiscal year 1987

	Permittees 1/		Cattle		Horses and burros		Sheep and goats		Total	
	Number	AUM's 2/	Number	AUM's	Number	AUM's	Number	AUM's	Number	AUM's
Permitted to graze	1,431,393	8,705,787	94,609	99,183	1,423,660	1,147,788	2,949,662	9,952,758		
Actually grazed: Paid permits	13,996	1,276,339	7,391,691	56,802	1,107,984	870,853	2,401,437	8,319,346		
Free use:										
Recreation stock	53,907	50	89,531	55,283			89,581	55,288		
Other free use	189	2,187	860	6,034	972	3,138	4,019	25,974		
Private Land Permit 3/	(426)	(68,157)	(440,880)		(21,737)	(22,129)	(90,519)	(472,274)		
Crossing	65	21,488	2,934	26			46,511	5,364		
Unauthorized use	72	707	117	2,566	196	80	1,020	5,144		
Total 3/	68,229	1,300,771	107,658	120,711	1,134,139	876,475	2,542,568	8,411,116		
Wild horses			1,127	14,056			1,127	14,056		
Wild burros			141	1,088			141	1,088		
Total actually grazed 3/	68,229	1,300,771	108,926	135,855	1,134,139	876,475	2,543,836	8,426,260		

1/ Permittees holding paid permits are not counted in other categories.

2/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.

3/ Private Land Permit data not included in totals.

Table 38—Range improvements by type—fiscal year 1987

Improvement type	Unit of measure	Units of construction completed	Total cost
Structural:			
Water developments	Sites	1,418	1,818,023
Range fence	Miles	1,266	2,925,721
Pipeline	Miles	150	455,037
Other structural facilities	Sites	362	561,014
Subtotal		-- <u>1/</u>	5,759,795
Nonstructural:			
Cover manipulation, brush	Acres	39,328	437,301
Range plant control	Acres	16,124	329,261
Forage improvement	Acres	64,776	806,796
Noxious farm weed control	Acres	21,385	986,168
Subtotal		141,613	2,559,526
Total			8,319,321

1/ -- = not applicable.

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Table 39—Road and bridge construction and reconstruction by State—fiscal year 1987

State, Commonwealth, or Territory 1/	From appropriated funds			By timber purchasers		
	Roads	Bridges	Cost 2/	Roads 3/	Bridges	Cost
	Miles	Number	1,000 dollars	Miles	Number	1,000 dollars
Alabama	19.9	1	1,447.5	45.8	0	506.1
Alaska	4.1 4/	5 4/	1,574.7 4/	73.4	1	640.4
Arizona	43.5	0	3,646.0	224.2	0	1,195.0
Arkansas	17.0	3	2,703.8	108.7	0	2,015.3
California	174.9	3	30,544.8	722.7	0	15,212.6
Colorado	139.4	7	7,877.3	109.6	0	1,381.6
Florida	4.6	0	817.6	60.8	0	935.9
Georgia	19.7	0	2,780.2	15.2	0	252.3
Idaho	257.7	12	16,615.4	567.4	0	8,391.8
Illinois	12.1	1	644.8	9.5	0	159.5
Indiana	0.1	0	100.0	0.0	0	0.0
Kentucky	16.2	0	1,205.0	50.5	0	298.8
Louisiana	17.6	1	1,131.2	32.0	0	621.6
Maine	0.0	0	31.5	0.0	0	0.0
Michigan	111.3	1	3,562.0	45.9	0	289.2
Minnesota	74.9	0	3,535.9	32.6	0	271.1
Mississippi	13.2	2	1,153.0	94.7	0	722.9
Missouri	56.8	0	1,191.3	33.1	0	171.3
Montana	407.1	9	23,774.0	309.9	0	4,072.6
Nebraska	3.0	0	32.1	0.0	0	0.0
Nevada	1.1	0	239.1	3.2	0	65.6
New Hampshire	13.9	2	599.3	4.0	0	41.0
New Mexico	44.7	2	6,089.3	186.2	1	1,722.8
New York	0.1	0	2.0	0.0	0	0.0
North Carolina	80.3	0	2,598.5	55.4	0	831.3
North Dakota	0.0	0	254.5	0.0	0	0.0
Ohio	3.7	0	603.8	2.9	0	28.2
Oklahoma	5.4	0	80.4	12.5	0	279.5
Oregon	299.7	13	45,961.0	1,481.9	0	37,915.0
Pennsylvania	15.6	0	825.4	39.7	1	418.0
Puerto Rico	0.0	0	41.4	0.0	0	0.0
South Carolina	6.5	1	918.5	86.7	1	1,266.5
South Dakota	29.9	3	2,328.8	142.6	0	1,647.5
Tennessee	39.0	0	1,193.4	37.5	0	201.3
Texas	9.7	0	785.2	58.3	0	1,151.2
Utah	67.6	3	4,511.5	70.9	0	307.9
Vermont	4.4	0	501.6	1.3	0	16.5
Virginia	85.9	4	2,994.0	39.5	0	190.3
Washington	114.0	15	22,726.3	350.3	0	12,012.0
West Virginia	37.6	1	1,926.1	13.0	0	364.4
Wisconsin	86.8	1	4,521.4	20.6	0	178.5
Wyoming	50.4	1	2,847.5	104.4	0	1,323.0
Total	2,394.4	91	206,917.0 5/	5,246.9	4	97,098.5

1/ States not listed had no Forest Service road programs in 1987.

2/ Includes funds for engineering and program support for appropriated roads and timber purchaser roads.

3/ Does not include 235.1 miles turned back to Forest Service for construction.

4/ Does not include Tongass Timber Supply Fund, \$20,794,400, 51.8 miles, and 42 bridges.

5/ Does not include \$6,315,100 of Washington Office funds and \$10,335,000 transferred to the Federal Highway Administration (FHWA). The FHWA funds constructed or reconstructed 8 miles of road and 11 bridges.

*Table 40—Timber purchaser roads constructed by the Forest Service by State—
fiscal year 1987*

State or Commonwealth 1/	Roads constructed	Cost
	Miles	1,000 dollars
Alabama	4.2 ^{2/}	137.1
Arkansas	9.2	80.2
California	3.4	111.0
Colorado	1.8	48.4
Florida	1.2	25.9
Georgia	3.2	181.7
Louisiana	1.1	36.4
Minnesota	2.9	17.7
Mississippi	3.6	220.6
Montana	24.5	302.8
New Hampshire	2.9	49.9
Ohio	0.7	16.3
Oklahoma	6.5	202.0
Oregon	60.9	2,336.0
Pennsylvania	13.5	133.8
South Carolina	8.6	285.7
South Dakota	63.8	696.7
Tennessee	4.7	78.9
Texas	3.6	51.5
Utah	0.0	52.0
Washington	8.7	372.0
Wyoming	6.1	30.5
Total	235.1	5,467.1

^{1/} States not listed had no timber purchaser roads constructed by the Forest Service in 1987.

^{2/} Includes one bridge.

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Table 41—State and Private Forestry funding—fiscal year 1987 compared to 1983-87 average

	1987 Actual	RPA	1983-87 average	Percent of actual to average
	1,000 constant	1987 dollars	1/	
Appropriated accounts				
Forest pest management	38,462	18,671	31,144	123.50
Fire protection	13,661	3,400	14,070	97.09
Forest management and utilization	10,026	0	11,878	84.41
Special projects	4,405	2,800	4,939	89.18
Subtotal	66,554	24,871	62,032	107.29
Transfer accounts				
Rural community fire protection	3,091	-- 2/	3,526	94.94
Watershed and flood prevention	3,884	--	3,845	88.01
Watershed planning	211	--	239	86.69
Resource conservation and development	643	--	783	102.43
River basin surveys and investigations	869	--	1,166	95.83
Forestry Incentives Program 3/	1,218	--	1,276	98.00
Agricultural Conservation Program 3/	1,800	--	1,939	98.00
Subtotal	11,716	--	12,502	93.99
Total	78,270	24,871	74,534	105.06

1/ Survey of Current Business (BEA) index values used for 1982-85. BEA updates gross national product implicit price deflators periodically. These are current as of June 1986.

2/ -- = not reported in the RPA.

3/ Includes only technical assistance allocated for the Forestry Incentives and Agriculture Conservation Programs (administered jointly by ASCS and FS).

Table 42—State and Private Forestry funding—fiscal years 1983-87

	1987	1986	1985	1984	1983
	<u>1,000 dollars</u>				
Appropriated accounts					
Forest pest management	38,462	28,329	28,825	29,179	27,844
Fire protection	13,661	13,032	13,739	14,016	14,411
Forest management and utilization	10,026	9,518	10,756	10,713	17,080
Special projects	4,405	4,442	4,972	6,845	3,500
Subtotal	66,554	55,321	58,292	60,753	62,835
Transfer accounts					
Rural community fire protection	3,091	3,110	3,250	3,250	3,250
Watershed and flood prevention	3,884	3,948	3,580	3,670	3,670
Watershed planning	211	221	240	250	250
Resource conservation and development	643	693	802	763	768
River basin surveys and investigations	869	1,040	1,117	1,229	1,229
Forestry Incentives Program <u>1/</u>	1,218	1,196	1,250	1,250	1,250
Agricultural Conservation Program <u>1/</u>	1,800	1,818	1,900	1,900	1,900
Subtotal	11,716	12,026	12,139	12,317	12,317
Total	78,270	67,347	70,431	73,070	75,152

1/ Includes only technical assistance allocated for the Forestry Incentives and Agriculture Conservation Programs (administered jointly by ASCS and FS.)

Table 43—Summary of State and Private Forestry accomplishments compared to funded output levels and to RPA—fiscal year 1987

	Unit of measure 1/	1987		Percent of funded	1983-87		1987 as percent of 5-year average	RPA recommended level	Percent of RPA accomplished
		Funded	Accomplished		average accomplishment	plishment			
Appropriated accounts									
Forest pest management 2/	MM acres	547	640	117.00	591.4		108.2	170	376.47
Insect and disease management surveys	MM acres	-- 3/	0.98	--	1.2		82.8	--	--
Insect and disease suppression	Projects	21	21	100.00	29.2		71.9	--	--
Insect and disease special projects									
Forest management and utilization									
Forest resource management	MM acres	3.5	4.3	122.86	3.8		113.8	2.2	195.45
Forest land management plans	MM cubic ft	--	305.3	--	268.3		113.8		--
Timber prepared for harvest	M acres	--	1,098.9	--	692.5		158.7	323	340.22
Reforestation 4/	M acres	--	240.1	--	290.1		82.8	156	153.91
Timber-stand improvement 5/	M owners	--	158.4	--	143.7		110.3		--
Woodland owners assisted	MM cubic ft	--	--	--	--		--	64	0.00
Wood utilization	MM seedlings	725	828	114.21	748.7		110.6	--	--
Seedling, nursery, and tree improvement	Areas assisted	--	4,633	--	4,551.6		101.8	--	--
Urban forestry assistance									
Management improvement									
State forest-resource planning	Person Years	--	28	--	6/		6/	44	63.64
Transfer accounts									
Rural community fire protection, FmHA	M approved applications	3.2	3.2	100.00	2.9		115.3	--	--
Watershed and flood prevention, SCS	Projects	81	81	100.00	84.2		96.2	--	--
Watershed planning, SCS	Plans	59	59	100.00	59.4		99.3	--	--
Resource conservation and development, SCS	Projects	46	46	100.00	48.6		94.7	--	--
River basin surveys and investigations, SCS	Plans	45	45	100.00	42.2		106.6	--	--
Forestry Incentives Program, ASCS 7/	M acres	--	163.1	--	158.5		102.9	--	--
Reforestation	M acres	--	24.7	--	36.0		68.7	--	--
Timber-stand improvement	M acres	--	80.9	--	73.8		109.6	--	--
Agriculture Conservation Program, ASCS 7/	M acres	--	16.7	--	24.7		67.7	--	--
Reforestation									
Timber-stand improvement									

1/ M = thousand, MM = million.

2/ Includes accomplishments on National Forest System and other Federal lands, as well as State and private lands.

3/ -- = not applicable.

4/ Includes Conservation Reserve Program, Forestry Incentives Program and Agriculture Conservation Program accomplishments.

5/ Includes Forestry Incentives Program and Agriculture Conservation Program Accomplishments.

6/ Not reported due to change in unit of measure from MM acres to person years.

7/ Accomplishments for 1987 are estimates; actual data is not available from ASCS.

Table 44—Pesticide use report—fiscal year 1987

Common name	Target pest or purpose	Quantity used	Acres treated
		Pounds <u>1/</u>	Units <u>2/</u>
<u>Herbicides:</u>			
Amitrole	Noxious weed control	10.00	5.00
Amitrole/ 2,4-D	Noxious weed control	15.00	20.00
Amitrole/ Atrazine 2,4-D	Rights-of-way	35.00	58.00
Ammonium sulfamate	Noxious weed control	2.00	
	Wildlife habitat	4.00	
Arsenal ^R	Conifer release	3.74	
	Research	6.00	1.00
	Rights-of-way	1,639.00	529.00
Asulam	Rights-of-way	1.07	5.00
Atrazine	General weed control	.03	.50
	Range management	40.00	24.00
	Research	18.00	6.00
	Rights-of-way	266.00	34.00
	Site preparation	20.00	7.00
Atrazine/ Glyphosate	Range management	22.50	20.00
		30.00	
Bifenox	Nursery weed control	115.00	38.60
Bromacil	Noxious weed control	20.00	40.00
Bromacil/ Diuron	Rights-of-way	230.00	96.00
Butylate	Conifer release	230.00	
Copper sulfate	Aquatic weed control	5.00	3.00
	Aquatic weed control	20.00	2.00
		48.60	18.00 acre feet
Copper triethanol- amine	Aquatic weed control	58.00	81.00 acre feet
Dacthal ^R	Nursery weed control	212.50	25.30
Dicamba	Noxious weed control	2,233.69	1,136.50
	Range management	28.00	220.00
	Rights-of-way	31.50	48.00
	Site preparation	29.00	845.00
	Wildlife habitat	62.00	41.00
Dicamba/ Picloram	Noxious weed control	3.00	244.00
		5.00	
Diphenamid	Nursery weed control	369.89	92.25
Diuron	General weed control	10.00	35.00
Endothall	Aquatic weed control	558.00	81.00 acre feet
Fosamine ammonium	Range management	24.00	31.00
	Rights-of-way	1,974.60	492.00
	Rights-of-way	2,445.00	237.00 side miles
	Wildlife habitat	80.00	8.00

See footnotes at end of table.

Report of the Forest Service Fiscal Year 1987

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1</u> /	Acres treated Units <u>2</u> /
Herbicides: (Cont.)			
Glyphosate	Aquatic weed control	452.00	151.00
	Conifer release	5,808.30	5,015.00
	General weed control	395.60	423.19
	General weed control	100.00	204.00 side miles
	General weed control	1.87	320.00 square feet
	Hardwood release	94.75	1,002.00
	Noxious weed control	931.16	938.50
	Nursery weed control	431.50	259.19
	Poisonous plant control	18.56	152.00
	Range management	90.00	91.00
	Research	28.00	20.00
	Rights-of-way	192.30	89.80
	Site preparation	4,630.00	4,012.00
	Wildlife habitat	249.00	261.00
	Conifer release	206.00	103.00
Glyphosate/ Oust ^R		12.87	
	Site preparation	56.00	117.00
		5.25	
Hexazinone	Conifer release	39,880.50	26,864.00
	Firebreak management	2.00	50.00
	General weed control	40.00	37.00 side miles
	Hardwood release	1,710.00	1,112.00
	Noxious weed control	258.40	390.00
	Range management	48.03	151.00
	Site preparation	57,429.55	27,358.00
	Thinning	258.00	240.00
	Wildlife habitat	2,087.10	1,812.00
Hexazinone/ Oust ^R	Conifer release	16.00	50.00
		4.00	
	Rights-of-way	6.00	2.00 side miles
Linuron	General weed control	47.00	24.00
Maleic hydrazide	Research	90.00	30.00
	Rights-of-way	221.00	61.00
Mefluidide	Rights-of-way	4.00	38.00
Metsulfuron methyl	Research	.12	5.00
	Rights-of-way	3.25	68.00
MSMA	Rights-of-way	503.00	162.00
Napropamide	Nursery weed control	194.00	65.66
Oryzalin	Rights-of-way	115.00	23.00
Oust ^R	Conifer release	308.77	3,099.00
	General weed control	8.18	255.00
	Noxious weed control	52.50	155.00
	Rights-of-way	5.62	54.00
	Site preparation	67.98	560.00
Oxadiazon	Site preparation	355.00	273.00

See footnotes at end of table.

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used	Acres treated
		Pounds <u>1/</u>	Units <u>2/</u>
<u>Herbicides: (Cont.)</u>			
Paraquat	General weed control	38.30	104.00
Picloram	Conifer release	32.39	104.00
	General weed control	2.38	1.00
	Noxious weed control	2,995.94	5,781.79
	Poisonous plant control	406.00	373.00
	Range management	251.80	898.00
	Rights-of-way	2.00	1.00
	Rights-of-way	73.00	75.00 side miles
	Site preparation	662.00	1,473.00
	Thinning	4.00	3.00
	Wildlife habitat	627.32	1,315.00
Picloram/ Fosamine ammonium	Rights-of-way	.50	3.90
Picloram/ Triclopyr/		6.00	
	Rights-of-way	56.80	156.40
		251.50	
	Wildlife habitat	7.00	29.00
		12.00	
Prometon	Rights-of-way	200.00	20.00
	Rights-of-way	8.00	1.00 side miles
Sethoxdin	General weed control	1.50	1.00
	Nursery weed control	233.00	190.00
Simazine	Aquatic weed control	4.00	8.00
	Aquatic weed control	54.00	8.60 acre feet
	General weed control	4.00	238.00
	General weed control	440.00	4,900.00 square feet
	Hardwood release	12.00	5.00
	Site preparation	54.00	12.00
Tebuthiuron	Noxious weed control	154.80	61.00
	Range management	612.00	1,210.00
	Wildlife habitat	694.10	581.00
Telar ^R	Noxious weed control	12.28	54.00
	Rights-of-way	2.15	112.00
Triclopyr	Conifer release	22,147.00	11,726.00
	Firebreak management	700.00	300.00
	General weed control	98.04	58.00
	Hardwood release	2,003.00	1,461.00
	Rights-of-way	239.20	143.70
	Rights-of-way	368.00	121.50 side miles
	Site preparation	12,732.30	11,173.00
	Thinning	243.00	264.00
	Wildlife habitat	837.22	2,341.00

See footnotes at end of table.

Report of the Forest Service Fiscal Year 1987

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1</u> /	Acres treated Units <u>2</u> /
Herbicides: (Cont.)			
2,4-D	Aquatic weed control	36.60	13.00
	Conifer release	1,895.70	1,058.00
	General weed control	55.00	55.00
	General weed control	50.00	97.00 side miles
	Hardwood release	402.78	110.00
	Noxious weed control	2,674.28	2,376.60
	Nursery weed control	236.90	127.00
	Poisonous plant control	9.00	5.00
	Range management	1,972.00	1,366.00
	Rights-of-way	667.00	334.00
	Rights-of-way	190.00	50.00 side miles
	Rights-of-way	4.00	100.00 trees
	Site preparation	6,226.00	2,954.00
	Thinning	1,352.00	252.00
	Wildlife habitat	2,561.00	1,599.00
	Rights-of-way	719.50	133.71
2,4-D/ 2,4-DP		719.10	
2,4-D/ 2,4-DP/ Triclopyr	Rights-of-way	246.05 246.05 266.00	133.00
2,4-D/ Dicamba	General weed control	52.00 27.00	52.00
	Noxious weed control	5,685.73 2,105.73	3,627.73
	Poisonous plant control	2.80 28.00	28.00
	Rights-of-way	71.00 37.00	35.00 side miles
2,4-D/ Dicamba/ 2,4-DP	Noxious weed control	2.00 1.00 2.00	5.00
2,4-D/ Hexazinone	Site preparation	355.00 1,147.00	540.00
2,4-D/ MCPA	General weed control	5.19 5.22	8.42
2,4-D/ Picloram	Conifer release	1,251.84 562.70	1,937.00
	General weed control	513.21 132.19	81.00
	Hardwood release	25.00 5.00	15.00
	Noxious weed control	3,931.40 1,466.91	5,353.80
	Poisonous plant control	315.00 67.50	180.00
	Rights-of-way	92.00 27.75	85.00
	Site preparation	1,469.31 401.87	3,764.00
	Thinning	13.36 3.51	42.00
	Wildlife habitat	423.10 199.30	1,466.00

See footnotes at end of table.

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1</u> /	Acres treated Units <u>2</u> /
<u>Herbicides: (Cont.)</u>			
2,4-D/ Picloram/ Triclopyr	Rights-of-way	622.20 176.02 527.69	334.00
2,4-D/ Telar ^R	Noxious weed control	103.00 21.70	1,448.00
2,4-D/ Triclopyr	Rights-of-way	30.00 19.00	6.00
	Wildlife habitat	9.00 4.00	4.00
2,4-DP	Conifer release	2,501.00	1,023.00
	Noxious weed control	97.80	51.00
	Site preparation	2,393.00	677.00
Total 1987 herbicide use		223,265.35	151,144.04

See footnotes at end of table.

Report of the Forest Service Fiscal Year 1987

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity	Acres	
		used	treated	
Insecticides:				
Azinphos-methyl	Cone and seed insects	2,470.00	398.00	(A)
	Cone borers	692.00	300.00	(A)
<u>Bacillus thuringiensis</u>	Gypsy moth	524,188.50	BIU	32,044.00 (A)
	Tent caterpillars	38,720.00	BIU	4,500.00 (A)
	Western spruce budworm	1,878,296.00	BIU	152,058.00 (A)
Carbaryl	Grasshoppers	162,255.00		324,510.92 (A)
	Mormon cricket	14,918.00		29,834.00 (A)
Diflubenzuron	Gypsy moth	270.00		4,654.00 (A)
Fenvalerate	Cone borers	36.00		58.00 (A)
	Seedbugs	204.00		292.00 (A)
Malathion	Grasshoppers	32,496.00		64,992.00 (A)
	Mormon cricket	8,330.00		16,600.00 (A)
Pyrethrins	Cone and seed insects	194.40		288.00 (A)
Acephate	Cone midges	.93		37.00 trees
	Fruit tree leaf roller	2.29	782,000.00	seedlings
	Greenhouse insects	.43	25,929.00	seedlings
	Greenhouse insects	.17	578.00	square feet
	Scale insects	568.00	1,061.00	
	Spruce beetle	1.88	74.00	trees
	Tussock moth	3.89	100.00	trees
	Western spruce budworm	.05	354.00	trees
Amdro ^R	Imported fire ant	1.38	66.00	bait stations
Azinphos-Methyl	Seedbugs	160.00	5,300.00	trees
<u>Bacillus thuringiensis</u>	Bagworms	384.00	BIU	24.00
	Gypsy moth	96.00	BIU	6.00
	Mosquitoes	1.00	BIU	1.00
Carbaryl	Aphids	2.00		3.00
	Aphids	.40	1,380.00	square feet
	Cone and seed insects	5.00		5.00
	Cottonwood leaf beetle	12.00		11.60
	Cutworms	2.00	130,000.00	seedlings
	Fleas	9.37		60.00
	Greenhouse insects	.40	1,380.00	square feet
	Mormon cricket	37.50		50.00
	Mountain pine beetle	10,728.50		12,593.00 trees
	Pine tip moth	7.00		7.00
Carbaryl	Miscellaneous insects	3.62		25.00 trees
Diazinon		2.39		
Carbaryl	Miscellaneous insects	2.43		25.00 trees
Malathion		1.25		
Carbofuran	Cone and seed insects	202.00		407.00 trees
	Cone midges	.80		38.00 trees
Chlorpyrifos	Aphids	3.00		37.50
	Pales weevil	6.62		16.00
	Webworms	26.00		26.00
Coumaphos	Mites	225.04		14,000.00 head of cattle

See footnotes at end of table.

Table 44--Pesticide use report--fiscal year 1987--Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1/</u>	Acres treated Units <u>2/</u>
<u>Insecticides: (Cont.)</u>			
Diazinon	Cutworms	5.00	2.00
	Grass insects	50.00	100.00
	Imported fire ant	2.50	5.00 dusting stations
	Nursery insects	142.00	150.00
Dicofol	Spider mites	.34	8,044.00 seedlings
Dimethoate	Cone midges	.86	39.00 trees
	Tip moths	4.67	10.70
Disulfoton	Birch leaf miner	1.19	1.00
Fenvalerate	Cone and seed insects	2.00	5.00
	Nursery insects	8.30	83.30
Lindane	Bark beetles	221.00	3,791.00 trees
	Cone and seed insects	193.00	1,800.00 trees
	Cone moth	.12	50.00 grafts
	Southern pine beetle	3.33	30.00
Malathion	Southern pine beetle	10.00	350.00 trees
	Aphids	60.00	24.33
	Aphids	1.06	4,000.00 seedlings
	Cone beetles	51.00	81.00
	Grasshoppers	9.91	7,360.00
	Greenhouse insects	1.00	4.00 greenhouses
	Greenhouse insects	1.85	12,451.00 seedlings
	Mosquitoes	204.00	100.00
	Miscellaneous insects	4.00	18.00
Methomyl	Aphids	1.50	4.50
Oxydemeton-methyl	Nursery insects	1.19	11.90
Permethrin	Seedbugs	4.00	1,000.00 trees
	Mosquitoes	3.00	37.50
Petroleum oil	Termites	2.10	4.00 buildings
Petroleum oil/ chlordans		5.10	
Pheromones	Douglas fir tussock moth	.03	14.00 treatment stations
	Mountain pine beetle	.03	20.00
	Mountain pine beetle	.03	128.00 bait stations
Pyrethrins	Pales weevil	3.00	5.00
Total 1987 insecticide use (including aerial use)		234,878.85	639,881.25
Total aerial use		221,865.4	630,528.92

Plus 25,933 trees, 1,074,487 seedlings, 4 buildings, 194 bait stations, 14,000 head of cattle,
4 greenhouses, and 3,338 square feet

See footnotes at end of table.

Report of the Forest Service Fiscal Year 1987

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1</u> /	Acres treated Units <u>2</u> /
<u>Fungicides and Fumigants:</u>			
Benomyl	Botrytis	109.00	241.90
	Botrytis	1.68	60,100.00 seedlings
	Damping-off	5.00	9.00
	Damping-off	4.00	20,000.00 seedlings
	Nursery fungi	423.00	90.00
	Nursery fungi	552.12	4,341,000.00 seedlings
	Nursery root rot	29.00	7.25
	Phomopsis canker	54.00	118.30
	Seedling blights	40.50	2.67
Benomyl/ Captan/ Chlorothalonil	Botrytis	7.00	130,000.00 seedlings
		1.00	
		22.50	
Borax	Annosus root disease	70.00	25.00
	Annosus root disease	35.00	925.00 stumps
Bordeaux Mixture	Diplodia tip blight	3.70	5.80
Captan	Botrytis	3.6	46.10
	Damping-off	55.00	79.00
	Greenhouse diseases	26.00	15.00 greenhouses
	Nursery fungi	4.40	265,000.00 seedlings
	Nursery fungi	.56	3,466.00 square feet
	Seed mold, mildew, or decay	.03	30.39 lb of seed
Chloropicrin/ Dichloropropene	Charcoal root disease	1,718.00	25.00
Chlorothalonil	Botrytis	7,507.00	
	Nursery blight	272.50	153.40
	Phoma blight	17.72	17.03
	Scleroderris	277.50	18.10
	Scleroderris	260.00	137.00
Dazomet	Damping off	390.00	1.00
	Nursery fungi	28,007.00	79.40
DCNA	Botrytis	25.91	22.49
	Botrytis	1.50	15.00 greenhouses
	Botrytis	3.75	225,000.00 seedlings
Dichloropropane	Nursery root rot	148.50	1.33
Dodine	Shot hole disease	6.50	5.00
Ethazol	Damping-off	6.00	.40
Ethazol/ Thiophanate-methyl	Damping-off	3.00	.40
		5.00	
Lime sulphur	Powdery mildew	1.64	.30
Maneb	Lophodermium needle blight	91.00	44.00
Metam-sodium	Nursery fungi	4.00	6,000.00 square feet
Metalaxyl	Nursery root rot	16.89	14.50
	Seedling root diseases/decay	2.98	629,000.00 seedlings
Methyl bromide	Nursery fungi	9.00	.05 square feet

See footnotes at end of table.

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used Pounds <u>1</u> /	Acres treated Units <u>2</u> /
<u>Fungicides and Fumigants:</u> (Cont.)			
Methyl bromide/ Chloropicrin	Charcoal root disease	21,172.00	79.00
		10,428.00	
	Damping-off	6,482.00	28.60
		3,094.00	
	Fusarium	3,484.80	32.50
		7,075.19	
	Nematodes	2,800.00	16.25
		2,800.00	
	Nursery fungi	28,946.00	132.40
		14,257.00	
Thiram	Damping-off	14.00	4,571.00 lb of seed
Triadimefon	Fusiform rust	39.00	38.00
	Sirococcus tip blight	.16	.40
	White pine blister rust	.54	12.00 tree groups
Zineb	Powdery mildew	1.56	.90
Total 1987 fungicide and fumigant use		140,821.49	1,472.42
Plus 1,670,100 seedlings, 4,601.39 pounds of seed, 925 stumps, 9,466 square feet, and 30 greenhouses			
<u>Predacides and Piscicides:</u>			
Antimycin	Undesirable fish	.20	5.50 acre feet
	Undesirable fish	0.50	10.00 acre feet
	Undesirable fish	2.57	29.80 stream miles
Rotenone	Undesirable fish	18.04	143.00
	Undesirable fish	2.00	65.00 acre feet
	Undesirable fish	30.00	27.25 stream miles
Sodium cyanide	Coyote	10.13	34,800.00
	Coyote	.10	50.00 bait stations
Total 1987 predacide and piscicide use		53.54	34,943.00
<u>Repellents:</u>			
Putrescent egg solids	Elk	1,622.70	15,627.00
Thiram	Birds	1,016.20	6,877.00 lb of seed
	Rabbits	430.00	215.00
Total 1987 repellent use		3,068.90	15,842.00

See footnotes at end of table.

Report of the Forest Service Fiscal Year 1987

Table 44—Pesticide use report—fiscal year 1987—Continued

Common name	Target pest or purpose	Quantity used	Acres treated
		Pounds <u>1/</u>	Units <u>2/</u>
<u>Rodenticides:</u>			
Aluminum phosphide	Ground squirrel	8.67	260.00
	Prairie dog	1.00	29.00
	Prairie dog	13.00	1,700.00 burrows
Diphacinone	Ground squirrel	38.00	202.00
Strychnine	Ground squirrel	.09	20.00 burrows
	Pocket gopher	1,412.73	51,675.90
	Pocket gopher	.12	95.00 burrows
Thiram	Other rodents	16.00	80.00 lb of seed
Zinc phosphide	Prairie dog	6.81	5,800.00
	Prairie dog	20.00	1,080.00 burrows
Total 1987 rodenticide use		1,516.42	57,966.90
Grand total pesticide use		603,614.55	901,249.61

1/ Unless other units are indicated. BIU = billion international units.
 2/ Unless other units are indicated. Aerial applications are indicated by (A).
 All others are ground application.

Table 45—Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)—calendar year 1986

State, Commonwealth, or Territory	Area protected 1,000 acres	Lightning fires	Person- caused fires	Total fires	Acres burned
Alabama	25,029	175	11,963	12,138	122,138
Alaska	134,000	110	397	507	85,252
Arizona	18,328	57	320	377	20,080
Arkansas	19,728	74	3,096	3,170	54,461
California	31,182	243	6,906	7,149	53,631
Colorado	25,958	108	1,136	1,244	52,864
Connecticut	2,390	3	1,114	1,117	3,481
Delaware	557	1	57	58	908
Florida	27,102	949	4,529	5,478	109,894
Georgia	27,279	1,002	11,872	12,874	58,654
Guam	82	0	347	347	1,323
Hawaii	3,306	1	133	134	9,944
Idaho	6,026	344	221	565	24,916
Illinois	8,453	0	43	43	431
Indiana	7,328	1	301	302	2,929
Iowa	7,612	5	980	985	7,782
Kansas	19,793	88	4,514	4,602	38,993
Kentucky	16,936	5	2,560	2,565	88,735
Louisiana	12,285	5	8,010	8,015	117,431
Maine	17,743	29	690	719	2,708
Maryland	3,552	20	1,133	1,153	4,906
Massachusetts	3,581	2	6,036	6,038	8,947
Michigan	20,600	13	480	493	9,712
Minnesota	22,830	8	938	946	18,279
Mississippi	19,858	25	9,159	9,184	137,913
Missouri	16,587	12	4,117	4,129	54,082
Montana	48,633	245	196	441	4,516
Nebraska	48,800	113	1,371	1,484	20,617
Nevada	8,777	70	94	164	11,675
New Hampshire	4,631	6	774	780	672
New Jersey	2,735	4	1,640	1,644	10,726
New Mexico	42,500	80	298	378	29,887
New York	16,958	12	439	451	3,795
North Carolina	19,540	183	5,320	5,503	113,021
North Dakota	31,879	84	364	448	3,592
Ohio	5,823	0	1,046	1,046	8,405
Oklahoma	5,087	24	1,905	1,929	50,248
Oregon	13,099	339	644	983	35,349
Pennsylvania	19,541	8	1,632	1,640	16,192
Rhode Island	512	0	110	110	376
South Carolina	13,038	310	7,390	7,700	42,533
South Dakota	20,653	120	358	478	3,572
Tennessee	12,672	25	5,375	5,400	59,721
Texas	22,123	6	1,476	1,482	19,317
Utah	15,000	211	246	457	25,165
Vermont	4,638	8	237	245	439
Virginia	18,325	34	2,008	2,092	13,833
Washington	13,177	166	675	841	3,842
West Virginia	12,833	29	2,267	2,296	130,044
Wisconsin	18,898	19	1,138	1,157	1,694
Wyoming	25,540	147	399	546	15,325
Total	943,537	5,573	118,454	124,027	1,714,950

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Table 46—Summary of selected cooperative forest management and processing program activities—selected fiscal years

	Woodland owners assisted	Timber-sale assistance-- volume marked MBF ^{1/}	Loggers and processors assisted
1945	8,093	411,330	0
1950	22,828	518,566	0
1955	34,828	549,373	8,182
1960	82,188	569,178	8,099
1965	99,074	716,950	9,248
1970	115,197	1,225,520	13,620
1971	127,828	860,950	14,627
1972	274,001	955,627	5,290
1973	106,422	1,578,664	4,855
1974	117,990	907,311	5,353
1975	140,940	677,532	5,405
1976	105,184	596,599	15,318
1976-77 (T.Q.) ^{2/}	25,253	220,649	5,849
1977	133,619	921,171	29,101
1978	165,329	1,120,743	12,749
1979	183,585	755,103	11,393
1980	176,385	870,964	11,582
1981	164,279	683,181	18,609
1982	141,472	841,475	15,470
1983	136,265	872,125	8,717
1984	151,539	1,033,440	10,082 ^{3/}
1985	134,338	913,411	-- ^{4/}
1986	137,753	855,813	-- ^{4/}
1987	158,353	1,225,896	-- ^{4/}

^{1/} MBF = thousand board feet.

^{2/} Transition quarter.

^{3/} Not all states reported.

^{4/} Inadequate data due to lack of State grants in wood-utilization program.

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Table 47--Summary of selected cooperative forest management and processing activities, by Region--fiscal year 1987

Assistance activity	Unit of measure <u>1/</u>	Regions				
		Northern	Rocky Mountain	South-western	Inter-mountain	Pacific Southwest
Woodland owners assisted	Number	2,580	2,898	257	395	4,196
Forest management plans prepared	Number Acres	533 49,803	425 24,620	64 12,693	20 48,408	207 32,003
Reforestation:						
Planting	Acres	767	1,176	253	195	6,673
Seeding	Acres	0	42	0	50	408
Management for natural regeneration	Acres	113	2,756	3,515	203	4,065
Timber stand improvement	Acres	830	1,791	217	1,377	3,358
Outdoor recreation development	Acres	680	3,785	4,660	819	1,546
Wildlife habitat development	Acres	143	4,357	4,890	6,947	60,197
Forested range improvement	Acres	167	2,378	4,943	3,256	2,101
Timber sale assistance volume harvested	M cubic feet	2,193	3,113	1,214	822	6,541
Urban forestry assistance activities	Urban areas assisted	216	507	17	29	798
Referrals to consulting foresters	Number	52	118	29	12	657

See footnotes at end of table.

**Table 47—Summary of selected cooperative forest management and processing activities, by Region—
fiscal year 1987—Continued**

Assistance activity	Unit of measure <u>1</u> /	Regions			North- eastern Area	Total
		Pacific Northwest	Alaska	Southern Region		
Woodland owners assisted	Number	6,457	112	79,895	61,563	158,353
Forest management plans prepared	Number Acres	762 96,806	26 1,500	49,572 2,795,370	22,160 1,240,932	73,769 4,302,135
Reforestation: Planting	Acres	20,779	882	834,726	70,950	936,401
Seeding	Acres	0	0	6,400	762	7,662
Management for natural regeneration	Acres	9,444	0	70,950	63,837	154,883
Timber-stand improvement	Acres	29,275	0	148,101	55,231	240,180
Outdoor recreation development	Acres	0	150	113,028	89,529	214,197
Wildlife habitat development	Acres	2,471	1,000	409,270	224,110	713,385
Forested range improvement	Acres	2,145	0	39,938	24,124	79,052
Timber sale assistance volume harvested	M cubic feet	14,941	4,923	155,034	116,509	305,290
Urban forestry assistance activities	Urban areas assisted	31	2	1,097	1,936	4,633
Referrals to consulting foresters	Number	113	41	5,775	8,689	15,486

1/ M = thousand.

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Table 48--Summary of selected cooperative forest management and processing activities, by State--fiscal year 1987

State, Commonwealth, or Territory	Woodland owners assisted	Reforesta- tion assistance	Timber-stand improvement assistance	Timber-sale assistance-- harvest volume	State nursery production
		Acres	Acres	1,000 cubic feet	1,000 trees
Alabama	14,635	115,825	41,063	0	76,654
Alaska	112	882	0	4,923	342
Arizona	122	3,718	167	614	0
Arkansas	2,551	33,392	2,007	657	26,406
California	3,638	10,886	3,113	6,503	2,838
Colorado	920	2,724	345	2,591	1,520
Com. of N. Marianas	0	16	18	0	4
Connecticut	839	1,066	158	159	1,800
Delaware	830	1,456	16	347	0
Florida	3,253	97,260	10,690	4,124	96,144
Fed. Sta. Micronesia	201	60	213	0	32
Georgia	14,773	225,532	10,619	1,499	156,020
Guam	7	39	10	0	70
Hawaii	320	140	0	38	513
Idaho	915	321	273	616	595
Illinois	5,066	3,166	3,909	996	2,998
Indiana	2,739	6,493	7,694	1,515	4,700
Iowa	1,497	6,265	1,279	660	3,391
Kansas	610	750	581	259	157
Kentucky	1,274	8,013	2,416	4,190	12,207
Louisiana	1,529	22,848	15,434	604	43,000
Maine	1,116	28,335	1,939	266	1,300
Maryland	4,660	9,016	3,564	7,686	5,500
Massachusetts	1,849	14,953	4,199	10,816	0
Michigan	975	5,837	979	1,161	3,607
Minnesota	7,711	19,942	2,700	10,115	21,302
Mississippi	14,817	148,127	14,908	4,254	69,486
Missouri	3,558	3,445	7,450	5,777	6,800
Montana	789	307	433	1,552	1,058
Nebraska	990	185	47	68	0
Nevada	237	400	1,359	422	230
New Hampshire	2,947	625	2,051	2,884	420
New Jersey	857	926	631	806	502
New Mexico	135	50	50	600	14
New York	3,134	3,171	2,767	37,207	6,445
North Carolina	6,728	80,474	4,530	35,093	45,671
North Dakota	876	252	124	25	1,069
Ohio	2,808	5,358	5,045	2,934	5,869
Oklahoma	1,797	1,943	966	405	3,528
Oregon	5,239	23,033	26,079	10	14,200
Palau	30	5	4	0	23
Pennsylvania	2,960	2,945	2,241	1,643	4,405
Puerto Rico	1,934	582	759	18	552
Rhode Island	208	82	180	313	0
South Carolina	4,239	91,407	2,530	525	72,086
South Dakota	244	266	532	97	1,854
Tennessee	2,614	11,509	325	2,388	10,832
Texas	2,241	18,124	23,685	10,167	21,325
Utah	158	48	18	400	503
Vermont	3,781	351	2,765	4,439	500
Virginia	7,510	57,040	18,169	91,110	71,050
Washington	1,218	7,190	3,196	14,931	9,860
West Virginia	3,658	1,887	2,019	2,620	0
Wisconsin	10,370	20,230	3,645	24,165	18,640
Wyoming	134	49	286	98	0
Total	158,353	1,098,946	240,180	305,290	828,022

Table 49—Works of improvement installed on small watershed protection projects—fiscal years 1985-87 and total to date (P.L. 566 Act of 1954) ^{1/}

	Unit of measure	1987	1986	1985	Total 1954-87
Land Treatment					
Erosion Control					
Channel improvement	Miles	0	0	2	6.6
Channel stabilization	Miles	0	0	2	13
Contour terrace and furrows	Acres	0	0	0	1,440
Critical area stabilization by tree planting	Acres	1,046	1,360	1,014	47,179
Forest road and roadbank stabilization	Acres	36	64	5	6,065
Gully control	Miles	0	0	1	195
Grade stabilization structures	Number	0	0	0	3,296
Surface mined/revegetation	Acres	146	12	41	3,580
Woodland grazing control	Acres	58	22	1,137	297,270
Flood Prevention					
Fire roads, trails, and firebreaks and fuelbreaks	Miles	4	18	19	1,698
Fire control water developments	Number	0	0	0	43
Fire towers	Number	0	0	0	8
Heliports and helispots	Number	0	0	0	42
Intensified fire protection	Acres	4,214	1,015	313,365	2,645,558
Mobile fire equipment	Number	1	0	2	76
Other fire control improvements	Number	1	0	3	469
Radio installations	Number	1	0	5	54
Forest Management					
Forest stand improvement	Acres	1,809	1,617	0	1,085,892
Proper harvest cutting	Acres	2,609	2,415	2,481	558,516
Range and grass seeding	Acres	2	709	86	49,233
Recreation area development	Acres	714	730	966	34,494
Tree planting and seeding	Acres	3,040	9,089	4,753	317,569
Wildlife habitat development	Acres	3,242	1,102	3,745	49,659
Wildlife ponds	Number	0	0	2	84
Technical Assistance					
Watershed plans	Number	372	581	675	26,355
Area included	Acres	23,232	32,509	35,401	2,243,811

^{1/} Accomplishment reporting for the Small Watershed Program will be significantly changed in FY 1988 because information will no longer be collected in the current format.

- o Total accomplishments will be reported in three categories: Erosion Control, Flood Prevention, and Technical Assistance.
- o Accomplishments will be limited to activities which are supported by program funds. Fire Management and Forest Management activities which take place on these watersheds are primarily funded by other programs and reported elsewhere.
- o The reporting of total program accomplishments will be discontinued.

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Table 50—Works of improvement installed in flood prevention projects—fiscal years 1985-87 and total to date (P.L. 534 Act of 1944) ^{1/}

	Unit of measure	1987	1986	1985	Total 1944-87
Land Treatment					
Erosion Control					
Channel improvement	Miles	0	0	0	40.6
Channel stabilization	Miles	0	2	0	353
Critical area stabilization by tree planting	Acres	692	768	1,008	336,628
Diversion ditches	Feet	0	0	0	32,097
Floodwater retarding structures	Number	0	0	0	4
Forest road and roadbank Stabilization	Acres	61	722	456.5	20,973
Grade stabilization structures	Number	2	2	0	1,694
Streambank stabilization	Miles	0	0	0	11.3
Surface mined/revegetation	Acres	285	161	375	8,874
Woodland grazing control	Acres	10	777	590	191,822
Flood Prevention					
Access road construction	Miles	0	6	0	381.5
Firebreaks and fuelbreaks	Miles	15	15	0	3,497
Fire roads and trails	Miles	10	4	64	639
Fire hazard reduction	Acres	3,437	13,100	5	43,563
Fire water developments	Number	4	9	0	200
Fire towers	Number	0	0	0	46
Heliports and helispots	Number	0	0	0	461
Mobile equipment	Number	4	14	0	138
Other fire improvements	Number	0	0	0	226
Permanent radio installations	Number	0	0	0	318
Forest Management					
Forest stand improvement	Acres	691	838	0	662,483
Proper harvest cutting	Acres	828	1,697	4,733	682,740
Tree planting and seeding	Acres	2,134	2,693	3,130	530,278
Woodland thinning and release	Acres	0	0	1,865	458,486
Technical Assistance					
Watershed plans	Number	273	403	484	25,842
Area included	Acres	21,427	19,833	27,666	2,222,840
Woodland owners assisted	Number	4,741	2,835	2,425	650,615

^{1/} Accomplishment reporting for the Flood Prevention Program will be significantly changed in FY 1988 due to changes in the program.

o Total accomplishments will be reported in three categories: Erosion Control, Flood Prevention, and Technical Assistance.

o Accomplishments will be limited to activities which are supported by program funds. The Forest Management activities which take place on these watersheds are primarily funded by other programs and reported elsewhere.

o The reporting of total program accomplishments will be discontinued.

Table 51—Forest Research funding—fiscal year 1987 compared to 1983-87 average ^{1/}

	1987		1983-87	Percent of
	Actual	RPA	average	actual to
	1,000 constant 1987 dollars 2/			average
Appropriated funds:				
Land and resource protection research:				
Fire and atmospheric science	8,235	7,546	8,036	102
Forest insect and disease	22,989	20,178	21,606	106
Forest inventory and analysis	17,741	14,222	15,131	117
Renewable resources economics	4,477	4,456	4,617	97
Renewable resources management and utilization research:				
Timber management	23,891	21,339	22,055	108
Watershed management and rehabilitation	16,397	14,858	12,936	127
Wildlife, range, and fish habitat	11,757	9,291	9,561	123
Forest recreation	2,426	2,077	2,158	112
Forest products and harvesting	18,808	17,514	18,148	104
Special projects, competitive grants 3/	(6,000)	-- 4/	(4,069)	147
Subtotal	126,721	111,481	114,248	111
Research construction	343	344	698	49
Total, appropriated accounts	127,064	111,825	114,947	111
Reimbursable accounts	4,801	-- 4/	4,892	98
Grand total	131,865	111,825	119,839	110

- ^{1/} General administration has been eliminated from individual line items in calculating the average. Total appropriated general administration funds are included in the "General Administration" line item in tables 10 and 11.
- ^{2/} Survey of Current Business (BEA) index values used for 1982-85. BEA updates GNP implicit price deflators periodically. These are current as of June 1986.
- ^{3/} Funds transferred to the Office of Competitive Grants included here as a non-add item.
- ^{4/} -- = not reported in the RPA.

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Table 52—Forest Research funding—fiscal years 1983-87 ^{1/}

	1987	1986	1985	1984	1983
	1,000 dollars				
Appropriated funds:					
Land and resource protection research:					
Fire and atmospheric science	8,235	7,716	7,963	7,783	8,484
Forest insect and disease	22,989	20,186	21,147	22,129	21,577
Forest inventory and analysis	17,741	16,316	17,133	12,128	12,337
Renewable resources economics	4,477	4,370	4,513	4,748	4,979
Renewable resources management and utilization research:					
Timber management	23,891	21,501	22,161	22,137	20,585
Watershed management and rehabilitation	16,397	14,850	11,229	11,242	10,961
Wildlife, range, and fish habitat	11,757	9,072	9,108	9,163	8,706
Forest recreation	2,426	2,049	2,084	2,085	2,146
Forest products and harvesting	18,808	17,560	18,488	17,988	17,897
Special projects, competitive grants ^{2/}	(6,000)	(6,507)	(7,840)	0	0
Subtotal	126,721	113,620	113,826	109,403	107,672
Research construction	343	642	1,634	422	454
Total, appropriated accounts	127,064	114,262	115,460	109,825	108,126
Reimbursable accounts	4,801	5,746	5,159	5,192	3,563
Grand total	131,865	120,008	120,619	115,017	111,689

^{1/} General administration has been eliminated from individual line items. Total appropriated general administration is included in tables 10 and 11.

^{2/} New account in 1985. Funds are transferred to the Competitive Research Grants Office, in Science and Education, Department of Agriculture, which administers the competitive grants research program.

Table 53—Extramural research funded through the Forest Service—fiscal years 1986-87

Type of recipient	1987		1986	
	1,000 dollars	Number of grants	1,000 dollars	Number of grants
Domestic grantees:				
Universities and colleges:				
Land-grant research institutions	10,495	341	5,995	213
1890 Land-Grant and predominately black institutions	303	24	169	13
Other non-Land-Grant institutions	1,808	68	2,082	90
Subtotal, universities and colleges	12,606	433	8,246	316
Other domestic:				
Industrial firms	253	3	119	2
Profit organizations	--	--	--	--
Nonprofit institutions and organizations	638	15	945	17
Federal, State, and local governments	279	15	327	10
Private individuals	245	16	135	6
Small business innovation research	571	28	266	9
Subtotal, other domestic	1,986	77	1,792	44
Total, domestic	14,592	510	10,038	360
Foreign grantees:				
Universities and colleges	17	4	6	1
Government agencies	--	--	--	--
Nonprofit institutions and organizations	--	--	278	3
Private individuals	--	--	7	2
Total, foreign grantees	17	4	291	6
Grand total	14,609	514	10,329	366

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Table 54—Research publications by major subject area—fiscal years 1984-87

	Number of publications			
	1987	1986	1985	1984
Environmental Research:				
Watershed management	134	138	154	95
Wildlife	162	165	136	138
Range	92	94	64	88
Fisheries habitat	27	26	18	37
Forest recreation	62	65	69	59
Urban and community forestry	42	45	36	25
Disturbed areas rehabilitation	19	26	34	40
Atmospheric deposition and air pollution	36	39	35	24
Subtotal	574	598	546	506
Insect and Disease Research:				
Insect detection and evaluation	54	57	69	30
Insect biology	96	98	94	138
Insect control and management strategies	90	92	119	102
Disease detection and evaluation	67	65	51	10
Disease biology	46	48	45	55
Disease control and management strategies	24	29	37	48
Mycorrhizae	17	21	50	26
Wood products organisms	17	18	24	23
Subtotal	411	428	489	432
Fire and Atmospheric Sciences Research:				
Fire prevention, hazard reduction, and prescribed burning	20	20	19	11
Fire management methods and systems	20	21	25	27
Forest fire science	28	28	23	8
Ecological relations	18	19	35	19
Weather modification and weather effects	17	19	35	30
Subtotal	103	107	137	95
Timber Management Research:				
Forest biology	160	158	109	130
Silviculture and management	153	162	196	293
Growth and yield <u>1/</u>	66	69	68	-- <u>2/</u>
Genetics and tree improvement	78	87	100	89
Subtotal	457	476	473	512

See footnotes at end of table.

Table 54—Research publications by major subject area—fiscal years 1984-87—Continued

	Number of publications			
	1987	1986	1985	1984
Economics and Marketing Research:				
Forest resource evaluation	138	143	110	119
Forest economics	196	205	182	142
Subtotal	334	348	292	261
Products and Engineering Research:				
Forest engineering systems	70	71	84	66
Wood structural engineering	51	53	52	43
Chemistry, fiber, and fuel products	60	62	59	84
Utilization potential and processing of wood	128	135	133	126
Protection of wood in use	29	31	13	24
Subtotal	338	352	341	343
General	20	21	21	31
Grand total	2,237	2,330	2,299	2,180

1/ This subject area was not reported separately prior to 1985. In earlier years, publications were reported elsewhere in Timber Management Research.

2/ -- = not applicable.

Table 55—Summary statement of receipts and expenditures—fiscal years 1986-87

	1987		1986		Percent Change 1986 to 1987
	Receipts	Expendi- tures	Receipts 1,000 constant 1987 dollars	Expendi- tures	
National Forest programs:					
Receipts:					
Cash receipts and appropriation expenditures:					
Sale of timber and use of other forest resources	861,017	0	799,418	0	8
Use of National Grasslands and land utilization areas	37,377	0	32,357	0	16
Timber sale area betterment (K-V) 1/	196,695	0	156,092	0	26
Cooperative work for others	53,743	0	43,423	0	24
Brush disposal	61,214	0	52,936	0	16
Miscellaneous (sales, rentals, damages, etc.) 2/	12,344	0	12,234	0	1
Restoration of forest lands and improvements	183	0	176	0	4
Recreation permit sales and fees from designated areas	5	0	3	0	67
Timber salvage sales	18,137	0	20,677	0	-12
Operation & maintenance of quarters	5,730	0	5,352	0	7
Gifts, Donations and Bequests	45	0	0	0	100
Subtotal	1,246,490	0	1,122,668	0	11
Cash receipts from NFS lands collected in conjunction with, and deposited to, accounts of other agencies	103,514	0	77,725	0	33
Non-cash income (roads built by timber purchasers)	104,263	0	117,026	0	-11
Total	1,454,267	0	1,317,419	0	10
Expenditures:					
Operating costs	0	1,776,353	0	1,571,247	0
Capital outlay	0	191,626	0	147,430	0
Total	0	1,967,979	0	1,718,677	15
Other Forest Service programs:					
Forest Research programs:					
Forest research	0	135,991	0	122,557	11
Research construction	0	2,029	0	824	146
Cooperative research work	3,581	2,650	3,001	2,507	6
Gifts, donations, and bequests for forest rangeland research	27	117	25	4	8
Tongass timber supply fund	0	2,290	0	1,982	16
Energy security reserve	0	0	0	-3	0
Subtotal	3,608	143,077	3,026	127,871	19
					12

See footnotes at end of table.

Table 55—Summary statement of receipts and expenditures—fiscal years 1986-87—Continued

	1987		1986		Percent Change 1986 to 1987	
	Receipts	Expendi- tures	Receipts 1,000 constant 1987 dollars	Expendi- tures	Receipts	Expendi- tures
State and Private Forestry programs:						
State and private forestry cooperation	0	65,071	0	59,376	0	10
Rural community fire protection	0	3,069	0	3,019	0	2
Flood prevention and watershed protection	0	1,212	0	2,029	0	-40
License programs (Woodsy Owl and Smokey Bear)	87	29	96	95	-9	-69
Forestry incentives and other programs ^{3/}	0	1,825	0	2,072	0	-12
Subtotal	87	71,206	96	66,591	-9	7
Human Resource programs:						
Job Corps	0	57,720	0	56,448	0	2
Senior Community Service Employment	0	20,400	0	21,782	0	-6
Subtotal	0	78,120	0	78,230	0	0
Grand total, all programs	1,457,962	2,260,382	1,320,541	1,991,369	10	14
Cash receipts distributed to States, counties and Puerto Rico:						
Payments to States and Puerto Rico	0	262,069	0	212,241	0	23
Payment to Minnesota	0	716	0	716	0	0
Payments to counties, National Grasslands and Land Utilization Areas	0	7,367	0	15,327	0	-52
Subtotal	0	270,152	0	228,284	0	18
Internal equipment and supply service (Working Capital)	87,449	90,214	87,060	86,898	0	4
Reimbursements for work performed for government and others included above	0	68,901	0	73,416	0	-6

1/ K-V = Knutson-Vandenberg

2/ Includes sale of personal property and acquisitions of lands to complete land exchanges.

3/ Includes Resource Conservation and Development, River Basins, and Pesticide Impact assessment funds transferred from ARS.

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Table 56—Summary statement of values and expenditures—fiscal year 1987

Item	Units <u>1/</u>	Quantity	Average value per unit	Total value
		<u>1,000</u>		<u>Million dollars</u>
Value:				
Minerals				
Common variety	-- <u>2/</u>	--	--	42.4
Locatable	--	--	--	551.3
Leasable	M BDL	18,917.8	18.0	340.5
Gas	MMCF	189,663.2	1.87	354.7
Coal	M tons	41,221.0	45.95	1,894.1
Others		--	--	154.4
Timber (excl. free firewood)	MBF	113,190.0	88.65 <u>3/</u>	1,003.4
Recreation	RVD	192,872.3	8.70	1,678.0
Wilderness and primitive area	RVD	12,000.0	10.43 <u>4/</u>	125.2
Wildlife and fish				
Recreation	RVD	33,586.0	20.33	683.0
Commercial	M Pounds	106,000.0	968.0	102.6
Range <u>5/</u>	AUM	9,999.0	5.85	58.5
Water	AF-Yield	--	--	--
	AF-Quality	--	--	--
Total value				7,088.1
Expenditures:				
National Forest System				1,968.0
Forest Research				143.1
State and Private Forestry				71.2
Human Resource Programs				78.1
Total expenditures				2,260.4
Net value, total				4,827.7
Net value, National Forest System only				5,120.1

1/ BBTU = billion British thermal units; MBF = thousand board feet; RVD = recreation visitor-days; AUM = animal unit month; AF = acre feet; MMCF = million cubic feet, MBDL = thousand barrels.

2/ -- = not available

3/ Actual value at time of sale.

4/ Exclusive of wilderness, wildlife, and fish.

5/ Based on permitted to graze animal unit months of forage. Value is a Forest Service-wide weighted average based on maximum ability to pay. Ability to pay reflects income derived by the user from use of the resource.

Table 57—Statement of receipts—fiscal years 1983-87

Receipts	1987	1986	1985	1984	1983
			1,000 dollars		
Receipts from sale and use of forest resources:					
Timber and forest products	807,941	745,132	514,561	544,265	398,498
Grazing	8,104	8,617	9,040	9,618	10,183
Land uses	4,394	4,073	3,348	3,442	3,162
Recreation	30,579	30,275	30,829	27,541	27,801
Power	688	765	647	834	733
Minerals	46,688	42,913	77,522 1/	51,549	54,932
Subtotal	898,394	831,775	635,947	637,349	495,309
Receipts from deposits for expenditures on National Forests:					
Timber sale area betterment	196,695	156,092	186,107	165,463	134,351
Timber salvage sales	18,137	20,677	15,232	20,514	14,106
Brush disposal	61,214	52,936	53,734	60,290	47,844
Restoration of Forest Service lands and improvements	183	176	172	160	214
Cooperative work	53,743	43,423	38,613	43,976	33,859
Operation & maint. of quarters	5,730	5,352	4,854		
Gifts, donations & bequests	45	25	36		
Subtotal	335,747	278,681	298,748	290,403	230,374
Other receipts:					
Misc. (sale, rents, etc.)	11,947	10,644	5,236	14,844	7,506
Golden Eagle passports	5	3	2	4	4
Sale of personal property	12	17	10	35	19
Cooperative research	3,581	3,001	1,265	1,187	1,702
Royalties from sale of Smokey Bear and Woodsy Owl products	87	96	74	186	70
Acquisition of lands to complete land exchanges	385	1,573	1,086	380	109
Gifts, Donations, and Bequests for Forest RangeLand Research	27	0	0	0	0
Subtotal	16,044	15,334	7,673	16,636	9,410

See footnotes at end of table.

Table 57—Statement of receipts—fiscal years 1983-87—Continued

Receipts	1987	1986	1985	1984	1983
			1,000 dollars		
Other income:					
Estimated collections by Dep. of Energy for power licenses on Public Domain National Forest land	601	439	543	618	411
Estimated collections by Dep. of the Interior for mineral leases on Public Domain National Forest land	102,913	77,286	81,878	84,850	77,600
Value of roads built by timber purchasers in lieu of cash	104,263	117,026	107,949	154,108	153,203
Subtotal	207,777	194,751	190,370	239,576	231,214
Total	1,457,962	1,320,541	1,132,738	1,158,569	966,307
Other net deposits:					
Monies advanced on active timber sales: ^{2/}					
Bal. from previous year	219,872	192,180	213,853	264,534	143,580
Deposited current year	1,169,636	1,014,971	842,201	869,404	755,185
Trans. to other accounts	1,142,258	-987,279	-863,874	-920,085	-634,231
Bal. on deposit	247,250	219,872	192,180	213,853	264,534
Amounts deposited pending disposition: ^{3/}					
Bal. from previous year	9,396	18,553	328	15,292	12,483
Deposited current year	11,943	20,072	34,012	9,709	9,862
Trans. to other accounts	-4,847	-29,229	-15,787	-24,673	-7,053
Bal. on deposit	16,492	9,396	18,553	328	15,292
Subtotal	263,742	229,268	210,733	214,181	279,826
Total	1,721,704	1,549,809	1,343,471	1,398,145	1,246,133

1/ Includes \$19 million adjusted windfall profit tax payment for 1980-84.

2/ Timber sale deposits made by timber purchasers.

3/ Budget clearing account.

Table 58—Statement of receipts—fiscal year 1987

Receipts	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/ Other	Total
1,000 dollars				
Receipts from sale and use of forest resources:				
Timber and forest products	786,345	21,594	2	807,941
Grazing	7,334	4	766	8,104
Land Uses	3,771	55	568	4,394
Recreation	30,559		20	30,579
Power	679		9	688
Minerals	10,676		36,012	46,688
Subtotal	839,364	21,653	37,377	898,394
Receipts from deposits for expenditures on National Forests:				
Timber sale area betterment	196,695			196,695
Timber salvage sales	18,137			18,137
Brush disposal	61,214			61,214
Restoration of Forest Service lands and improvements	183			183
Cooperative work	53,743			53,743
Operation & maint. of quarters	5,730			5,730
Gifts, donations & bequests	45			45
Subtotal	335,747			335,747
Other receipts:				
Misc. (sale, rents, etc.)			11,947	11,947
Golden Eagle passports 2/			5	5
Sale of personal property 2/			12	12
Cooperative research			3,581	3,581
Royalties from sale of Smokey Bear and Woodsy Owl products			87	87
Acquisition of lands to complete land exchanges			385	385
Gifts, donations & bequests for forest rangeland research			27	27
Subtotal			16,044	16,044

See footnotes at end of table.

Table 58—Statement of receipts—fiscal year 1987—Continued

Receipts	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/ Other	Total
1,000 dollars				
Other income:				
Estimated collections by Dep. of Energy for power licenses on Public Domain National Forest land	601			601
Estimated collections by Dep. of the Interior for mineral leases on Public Domain National Forest land	102,913			102,913
Value of roads built by timber purchasers in lieu of cash	104,263			104,263
Subtotal	207,777			207,777
Total	1,382,888	21,653	37,377	1,457,962
Other net deposits:				
Monies advanced on active timber sales				
Bal. from previous year	219,872			219,872
Deposited current year	1,169,636			1,169,636
Trans. to other accounts	-1,142,258			-1,142,258
Bal. on deposit	247,250			247,250
Amounts deposited pending disposition				
Bal. from previous year	9,396			9,396
Deposited current year	11,943			11,943
Trans. to other accounts	-4,847			-4,847
Bal. on deposit	16,492			16,492
Subtotal	263,742			263,742
Grand total	1,646,630	21,653	37,377	1,721,704

1/ Land Utilization Projects.

2/ These receipts are credited to the Department of the Interior.

Table 59--Statement of expenditures--fiscal year 1987

	Total	Work for other public agencies (reimbursables) <u>1,000 dollars</u>
National Forest System:		
Protection and management	655,160	13,025
Fighting forest fires	260,820	7,163
Cooperative work for others	46,263	0
Cooperative law enforcement	6,268	7
Flood prevention and watershed protection	2,690	2
Restoration of forest lands and improvements	187	0
Reforestation and timber-stand improvement <u>1/</u>	92,719	3,943
Timber sale betterment (K-V) <u>2/</u>	139,597	0
Brush disposal	42,995	0
Timber salvage sales	17,370	0
Oregon-California grant lands	-13	0
Range betterment	3,738	0
Construction of facilities	26,332	253
Acquisition of lands, Forest Service	1,763	0
Acquisition of lands, Columbia Gorge	2,217	0
Acquisition of lands, Land and Water Conservation Fund	51,419	0
Construction of forest roads and trails	219,893	1,800
Timber purchaser roads constructed by the Forest Service	5,491	0
Restoration of roads, Federal highway funds	9,401	0
Road construction, Mount St. Helens, highway trust	6,763	0
Road and trail maintenance	70,050	21
Mount St. Helens emergency activities	1	0
Tongass timber supply fund	43,630	0
General administration	258,342	634
Operation & maintenance of quarters	4,883	0
Subtotal	1,967,979	26,858
Research:		
Tongass timber supply fund	2,290	0
Forest research	135,991	11,160
Construction of research facilities	2,029	1,436
Cooperative research	2,650	0
Energy security reserve, DOE	0	0
Gifts, donations, and bequests for forest and rangeland research	117	16
Subtotal	143,077	12,612

See footnotes at end of table.

Table 59—Statement of expenditures—fiscal year 1987—Continued

	Total	Work for other public agencies (reimbursables)
		<u>1,000 dollars</u>
State and Private Forestry:		
Cooperation and general forestry assistance	65,071	8,517
Resource conservation and development	629	
Rural community fire protection grants	3,069	
River basins	832	
Flood prevention and watershed planning	1,212	
Licensee programs (Smokey Bear and Woodsy Owl)	29	
Forestry Incentives Program, Agriculture Conservation Program, and Pesticide Impact Assessment	364	
Subtotal	71,206	8,517
Human Resource Programs:		
Job Corps	57,720	514
Senior Community Service Employment Program	20,400	20,400
Subtotal	78,120	20,914
Total	2,260,382	68,901
Internal equipment and supplies service:		
Working Capital Fund	90,214	90,214
Grand total	2,350,596	159,115

1/ Includes obligations of \$32,561,122 for Reforestation Trust Fund.

2/ K-V = Knutson-Vandenberg Act.

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Table 60--Statement of expenditures--fiscal years 1983-87

	1987	1986	1985	1984	1983
	<u>Million dollars</u>				
National Forest System	1,967.9	1,718.7	1,849.5	1,737.4	1,715.0
Forest Research	143.1	127.9	123.0	117.0	114.1
State and Private Forestry	71.2	66.6	72.0	69.0	72.6
Human Resource Programs	78.1	78.2	73.8	76.4	72.4
Working Capital Fund	90.2	86.9	81.0	94.9	86.5
Total <u>1/</u>	2,350.5	2,078.3	2,199.3	2,094.7	2,060.6

1/ Columns may not add due to rounding.

Table 61—Distribution of employees by program and occupational category—selected fiscal years

	1987	1986	1985	1980	1975
Research:					
Clerical	488	501	526	627	460
Technical	1,087	1,206	1,082	958	528
Administrative	302	246	241	302	246
Professional	1,284	1,240	1,253	1,452	1,408
Subtotal	3,161	3,193	3,102	3,349	2,642
State and Private Forestry:					
Clerical	58	46	46	163	81
Technical	47	46	41	80	31
Administrative	47	27	26	42	28
Professional	119	100	110	347	256
Subtotal	271	219	223	632	396
National Forest System:					
Clerical	4,121	4,351	4,849	6,361	6,411
Technical	22,657	23,726	26,158	30,036	28,774
Administrative	3,218	3,104	3,073	2,370	1,860
Professional	9,086	9,014	9,533	9,082	7,562
Subtotal	39,082	40,195	43,613	47,849	44,607
Total	42,514	43,607	46,938	51,830	47,645
Full-time equivalents	36,744	36,918	38,524	49,005	30,123

Table 62—Distribution of employees by tour of duty as reported in July of selected years

	1987	1986	1985	1980	1975
Permanent full-time	27,400	27,419	29,211	21,421	19,568
Other permanent	2,901	3,017	3,713	15,815	12,115
Temporary	15,783	14,121	15,019	24,043	18,076
Total	46,084	44,557	47,943	61,279	49,759

Table 63—Summary of Forest Service Human Resource Programs—fiscal year 1987

Program	Program funding	Value of work accomplished	Persons served	Percent		Person years accomplished	Percent placement	Return per dollar invested
				Women	Minority			
				Dollars				
Million dollars								
Youth Conservation Corps <u>1/</u>	Unfunded	4.3	1,960	42	20	404	-- <u>2/</u>	1.19
Job Corps <u>3/</u>	57.2	18.3	9,097	16	57	3,804	85	--
Senior Community Service Employment Program <u>3/</u>	20.8	31.6	5,795	35	21	2,728	16	1.51
Volunteers in the National Forests <u>4/</u>	Unfunded	23.8	57,298	30	6	1,827	--	--
Hosted programs	Unfunded	9.5	6,568	20	34	761	--	--
Total	78.0	87.5	80,718	--	--	9,524	--	--

1/ Funds were not directly appropriated for Youth Conservation Corps; the Congress earmarked not less than \$1 million to be expended from funds available to the Forest Service. We operated a \$3.6 million YCC program.

2/ -- = not applicable.

3/ Statistics are for the July 1, 1986, through June 30, 1987, program year.

4/ Statistics include the Touch America Project (TAP).

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